



6. Traffic Study Technical Memorandum (Traffic Study)



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Technical Memorandum

July 10, 2025

Project# 32096

To: Curleigh Carothers, PE - City of Camas
Anita Ashton - City of Camas
616 NE 4th Avenue
Camas, WA 98607

CC: Terry Wollam – Wollam & Associates

From: Kristine Connolly, PE

RE: Green Mountain Lacamas Village

Subject: Transportation Compliance Letter

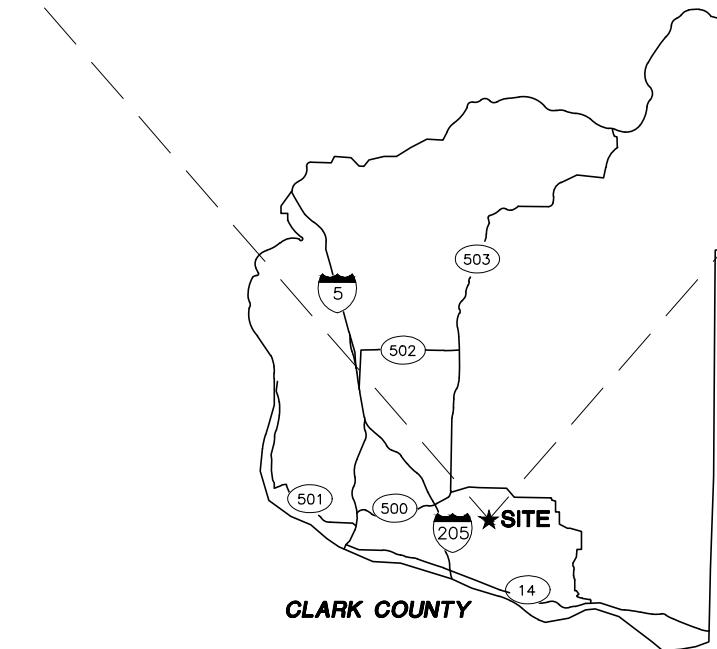
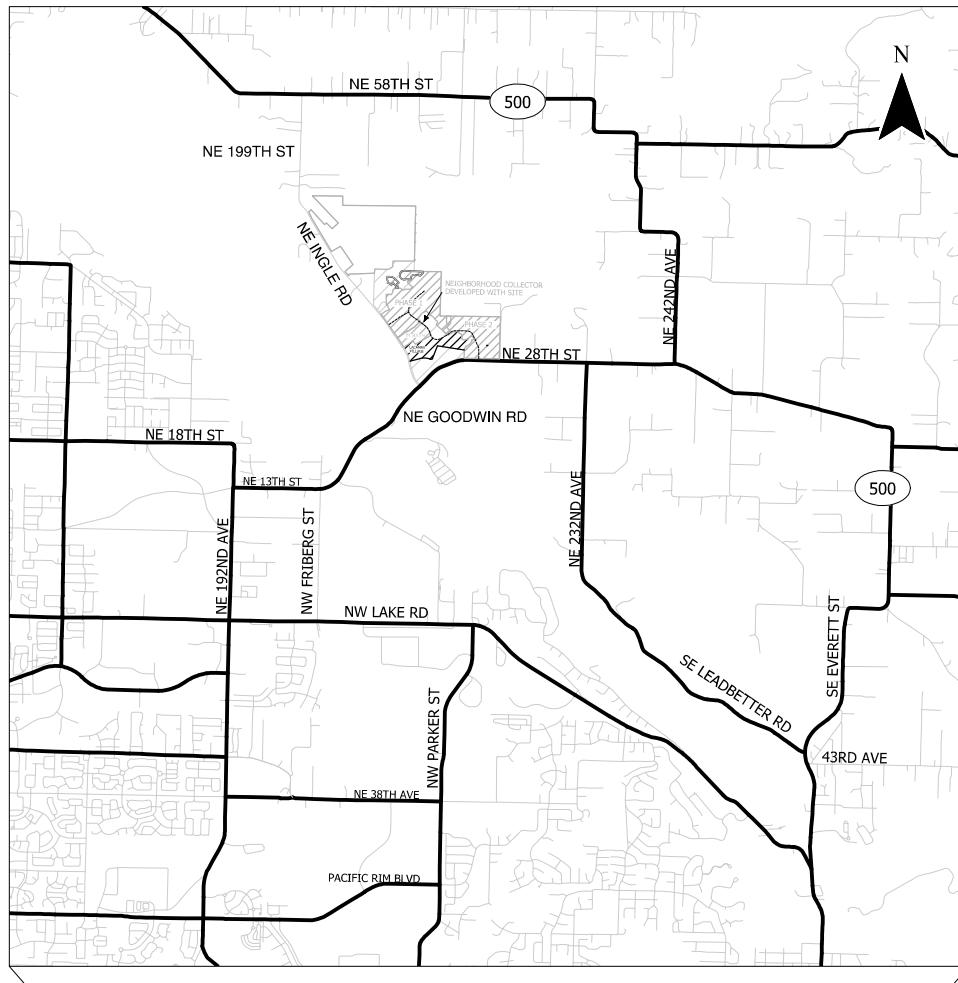


This memorandum provides transportation compliance documentation supporting the proposed Green Mountain Lacamas Village development within the previously approved Green Mountain Master Plan. The Master Plan site is located immediately east of NE Ingle Road and north of NE Goodwin Road in Camas. The contents of this memorandum are based on the recommendations provided in the *Green Mountain Master Plan Transportation Impact Analysis* (TIA), prepared by Kittelson & Associates, Inc. and dated June 2014 (provided in Appendix A). The intent of this memorandum is to document the Green Mountain Lacamas Village trip generation and confirm that the mitigation measures provided in the Masterplan TIA are applied at the appropriate phase of development.

Background

The TIA for the Green Mountain Master Plan prepared in 2014 provided a near- and long-term analysis for full buildup of the Green Mountain site, including 283-acres of mixed-use development. Figure 1 illustrates the site vicinity and location of the Master Plan site, as well as the Green Mountain Lacamas Village development. A mix of residential and commercial uses is planned for the full Master Plan area in accordance with the zoning.

Development of Green Mountain Lacamas Village is currently proposed, with the site plan shown in Figure 2. The Green Mountain Lacamas Village development consists of up to 160 single family homes. The western portion of the site will provide an access to 87th Avenue and an access to 89th Avenue. The eastern portion of the site will be accessed via Boxwood Street.



Site Vicinity Map
Camas, Washington

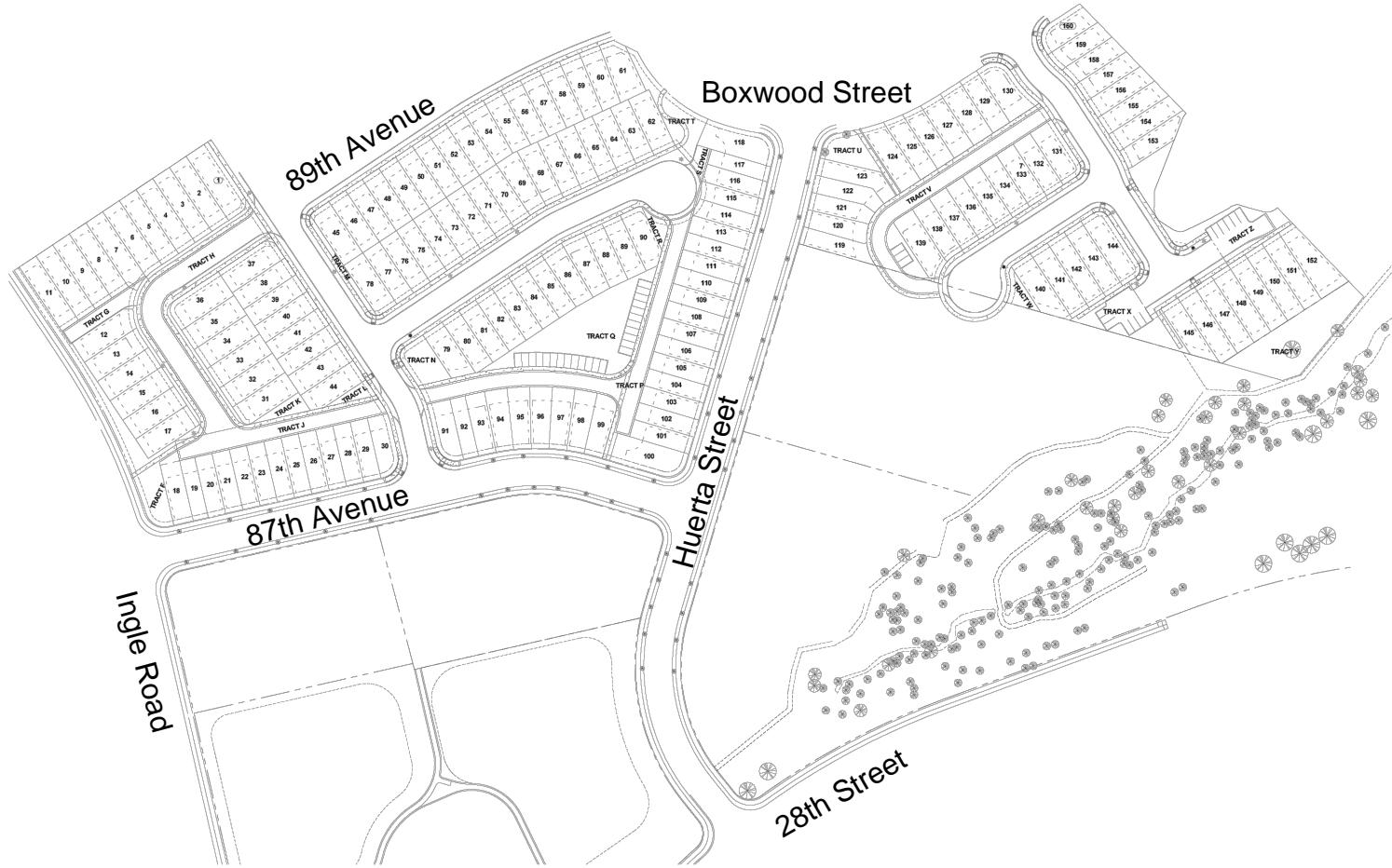
Figure
1

Layout Tab: Site Plan 1

BMW

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NOT TO SCALE



Proposed Site Plan Camas, Washington

Figure 2

Scope of the Report

This analysis identifies the transportation-related impacts associated with the Green Mountain Lacamas Village and was prepared in accordance with the recommendations outlined in the Master Plan TIA. The following information is presented:

- Estimated daily, weekday AM and weekday PM peak hour trip generation of the proposed homes.
- The cumulative number of site-generated trips used by the previously approved site development and the proposed homes as well as the number of Master Plan site-generated trips remaining assuming approval of the proposed homes.
- Evaluation of outstanding mitigation needs (as appropriate consistent with the Master Plan recommendations) involving assessment of proportionate share contribution at NE 192nd Avenue/NE 13th Street intersection.
- Access considerations.
- Conclusions and recommendations.

Current Proposed Development Plan

The Green Mountain Lacamas Village development consists of up to 160 single-family homes to be completed and occupied by 2028. The Green Mountain Lacamas Village development is located in the southern portion of the overall Master Plan site, with access to the majority of the site anticipated to be made via 87th Avenue. The development will also have an access off Boxwood Street and N 89th Avenue.

Trip Generation

Trip generation estimates for the proposed homes were prepared based on information provided in the *Trip Generation Manual, 9th Edition*¹¹ published by the Institute of Transportation Engineers (ITE – Reference 1). Table 1 summarizes the daily, weekday AM, and weekday PM peak-hour trips for the Green Mountain Lacamas Village.

Table 1: Trip Generation Estimate – Green Mountain Lacamas Village

Land Use	ITE Code	Size	Daily	Weekday AM Peak Hour			Weekday PM Peak Hour		
				Total	In	Out	Total	In	Out
Single-Family Detached Housing	210	160 dwelling units	1,523	120	30	90	160	101	59

¹¹ The analysis utilizes the ITE *Trip Generation Manual 9th Edition*, the same manual utilized in the Green Mountain Master Plan, Phase 1, Phase 2, and B1 Green Mountain developments. By comparison, and for reference, use of trip rates from the ITE *Trip Generation Manual, 11th Edition* for single-family detached housing results in fewer projected trips than the assumed 9th Edition rates (11th Edition trip rates project 1,509 weekday daily trips, 112 total AM peak hour trips, and 150 total PM peak hour trips).

Table 2 summarizes the overall master plan trip generation and then deducts for the cumulative Phase 1², Phase 2², and B1 South development trips to summarize the number of net new trips that will remain vested.

Table 2: Master Plan Trip Generation and Build-out Debiting (Includes Phase 1, Phase 2, B1 South, and Green Mountain Lacamas Village)

Land Use	ITE Code	Size	Daily	Weekday AM Peak Hour			Weekday PM Peak Hour		
				Total	In	Out	Total	In	Out
Apartment	220	536 units	3,570	275	55	220	330	215	115
Single-Family Detached Housing	210	764 units	7,270	575	145	430	765	480	285
Total Residential (1,300 units)			10,840	850	200	650	1,095	695	400
Internalization (6% Daily, 54% PM)			630	0	0	0	60	30	30
Shopping Center	820	90,000 square feet	6,340	145	90	55	560	270	290
Internalization (10% Daily, 11% PM)			630	0	0	0	60	30	30
Pass-By Trips (34%)			1,940	50	25	25	170	85	85
Total Vested Trips			17,180	995	290	705	1,655	965	690
Less Internalization			1,260	0	0	0	120	60	60
Less Pass-by trips			1,940	50	25	25	170	85	85
Vested Net New Trips for Full Build-out			13,980	945	265	680	1,365	820	545
Deduct for Net New Trips for Phase 1			1,914	150	40	110	200	125	75
Deduct for Net New Trips for Phase 2			2,170	170	40	130	230	145	85
Deduct for Net New Trips for B1 South			740	55	10	45	65	45	20
Deduct for Net new Trips for Green Mountain Lacamas Village			1,523	120	30	90	160	101	59
Remaining Trips			7,633	450	145	305	710	404	306

As seen in Table 2, after accounting for Phase 1, Phase 2, B1 South, and Green Mountain Lacamas Village development, a total of 7,633 daily; 450 weekday AM peak hour; and 710 weekday PM peak hour trips remain in the master plan approval.

² While previous traffic analysis assumed 215 units in Phase 1, Phase 1 as platted consists of 201 units. While previous traffic analysis assumed 230 units in Phase 2, Phase 2 is now platted for 228 units. The updated trip totals are shown in Table 2.

Evaluation of Outstanding Mitigation Needs

The Master Plan TIA identified a proposed proportionate cost sharing methodology to fund future construction of a northbound right-turn lane and a westbound right-turn lane on NE 13th Avenue at NE 192nd Avenue (the only mitigation measure not yet implemented), provided in Appendix B. Under this methodology, each weekday PM peak hour trip would be assessed a fee of \$391. Based on the Green Mountain Master Plan trip assignment (refer to Appendix A), approximately 37% of residential trips are expected to travel through the NE 192nd Avenue/NE 13th Street intersection. The development will add 59 trips to the intersection during the weekday PM peak hour and therefore should be responsible for contributing \$23,069 towards future improvements at the intersection.

Access Considerations

As seen in Figure 2, the proposed homes will be accessible to motor vehicles by one access each located on 87th Avenue, 89th Avenue and Boxwood Street. Sufficient intersection capacity at the connections to Ingle Road and 28th Street was demonstrated in the Master Plan TIA. Additional access considerations are described below.

Turn Lanes

Construction of a southbound left-turn lane on Ingle Road approaching 87th Avenue and an eastbound left-turn lane on 28th Street approaching Huerta Street is proposed in accordance with City of Camas design requirements, consistent with the Master Plan TIA. The new turn lanes will reduce the potential delay incurred by through traffic related to traffic turning left into the site.

Sight Distance

The location of 87th Avenue was selected to maximize available intersection sight distance at the Ingle Road connection point considering the horizontal curve along the south portion of the Ingle Road frontage as well as vertical curves along the roadway. The project civil engineering site plans document the available intersection sight distance at the Ingle Road/87th Avenue and 28th Street/Huerta Street intersections.

FINDINGS AND RECOMMENDATIONS

This transportation compliance letter concludes the proposed Green Mountain Lacamas Village can be developed while maintaining acceptable levels of service at the study intersections using previously vested Master Plan trips. The primary study findings and recommendations are summarized below.

Findings

- The Green Mountain Lacamas Village development includes up to 160 single-family homes and is estimated to generate 1,523 daily trips, 120 net new AM peak hour trips, and 160 net new PM peak hour trips.
- After accounting for the Green Mountain Lacamas Village development; a total of 7,633 daily; 450 weekday AM peak hour; and 710 weekday PM peak hour trips remain vested in the master plan approval.
- The Green Mountain Lacamas Village development is projected to add 59 weekday PM peak hour trips to the intersection of NE 192nd Avenue/NE 13th Street. This trip impact triggers a proportionate cost share of \$23,069 (\$391 per trip) based on the mitigation methodology presented in the Master Plan TIA.

Recommendations

- Subject to concurrency by City of Camas, the following should be provided in conjunction with the Green Mountain Lacamas Village site development:
 - Contribution of \$23,069 towards future improvements at NE 192nd Avenue/NE 13th Street.
 - Signing and striping on NE Ingle Road at 87th Avenue to accommodate the new intersection and the proposed southbound left-turn lane in accordance with City of Camas design requirements.
 - Signing and striping on 28th Street at Huerta Street to accommodate the new intersection and the proposed eastbound left-turn lane in accordance with City of Camas design requirements.
 - On-site and off-site landscaping and any above ground utilities at the new 87th Avenue connection to NE Ingle Road, new Huerta Street connection to 28th Street, and all site accesses should provide adequate intersection sight-distance in accordance with City requirements.

We trust this letter adequately addresses the traffic impacts associated with the proposed Green Mountain Lacamas Village. Please contact us if you have any questions or comments regarding the contents of this report or the analysis performed.

REFERENCES

1. Institute of Transportation Engineers. *Trip Generation Manual, 9th Edition*. 2012.

Appendix

Appendix A. June 2014 Green Mountain Master Plan Transportation Impact Analysis

Appendix B. Proportionate Share Cost Methodology

Appendix A
June 2014 Green Mountain Master Plan Transportation
Impact Analysis



MEMORANDUM

Date: November 20, 2014 Project #: 13865

To: Curleigh Carothers, P.E.; City of Camas

cc: Ryan Lopossa, P.E.; City of Vancouver
 Jeff Barsness, P.E.; Washington State Department of Transportation
 David Jardin, Clark County
 Randy Printz, Landerholm Law Firm
 John Schmidt and John O'Neil; Green Mountain Land, LLC

From: Chris Brehmer, P.E., Kelly Laustsen, and Ribeka Toda; Kittelson & Associates, Inc.

Project: Green Mountain Master Plan

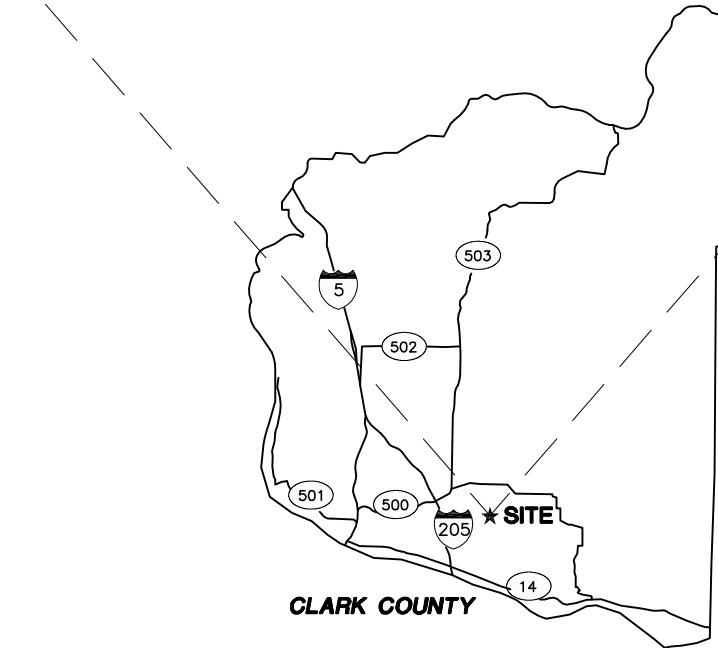
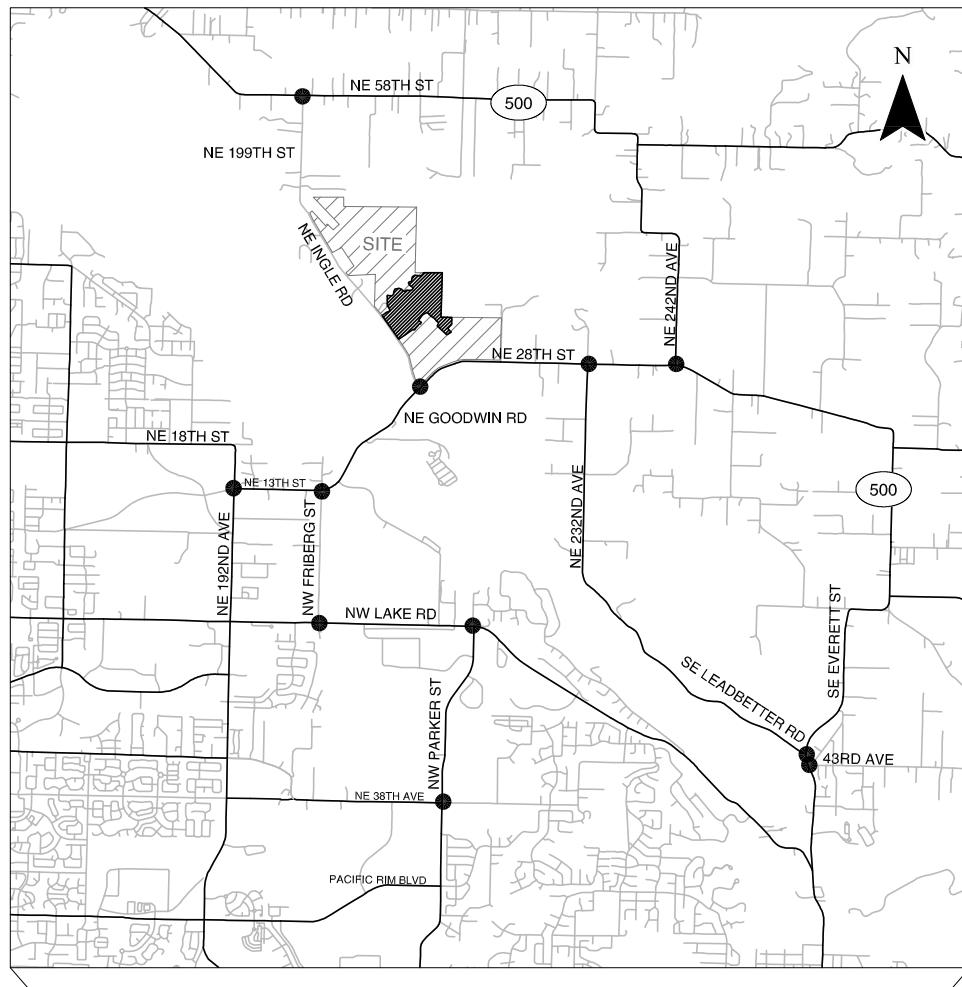
Subject: Transportation Impact Analysis

This memorandum documents the results of the transportation impact analysis prepared by Kittelson & Associates, Inc. (KAI) for the proposed Green Mountain Master Plan development to be located at the northeast corner of NE Ingle Road and NE Goodwin Road in Camas, Washington. This study concludes that Phase 1 of the site can be developed as proposed while maintaining safe and acceptable traffic operations at the study intersections assuming provision of an eastbound left-turn lane on NE Goodwin Road at NE Ingle Road. Further transportation improvements are recommended to accommodate full build-out of the proposed development. The methodology of our analysis, pertinent findings, and our recommendations are documented in this memorandum.

INTRODUCTION

Green Mountain Land, LLC is in the process of preparing a master plan to establish a mixed-use development on the 283-acre site. Green Mountain Golf Course is currently located on a large portion of the property; otherwise the site is vacant. The site is currently zoned for a mix of residential uses (R-10, MF-10 and R-6) and Community Commercial (CC). Figure 1 illustrates the site vicinity map.

The master plan proposes eight phases of development, with the sequence and timing of phases largely market dependent. It is expected that Phase 1 will be completed by 2018 and full master plan build-out will be assumed by 2029 for traffic impact assessment purposes.



● - Study Intersections

Site Vicinity
Camas, Washington

Figure
1

Figure 2 illustrates a conceptual image of the master plan site vision. A mix of residential and commercial uses is planned in accordance with the zoning, with a mixed use village proposed to better integrate the commercially zoned portion of the property. The village would be located at the southwest corner of the project and will encompass approximately twenty-four acres. Further project details are provided later in this report.

SCOPE OF THE REPORT

This analysis identifies the transportation-related impacts associated with the proposed Green Mountain Master Plan development and was prepared in accordance with City of Camas transportation impact analysis requirements. The study scope and overall study area for this project were selected based on a review of the local transportation system and direction provided by City of Camas, City of Vancouver, Clark County, and Washington Department of Transportation (WSDOT) staff.

Operational analyses were performed at the following intersections:

- NE 199th Avenue/NE 58th Street (SR 500, WSDOT maintained)
- NE 192nd Avenue/NE 13th Street (City of Vancouver maintained)
- NW Friberg Street/NE Goodwin Road
- NE Ingle Road/NE Goodwin Road
- NE 232nd Avenue/NE 28th Street
- NE 242nd Avenue (SR 500)/NE 28th Street (WSDOT maintained)
- NW Friberg Street/NW Lake Road
- NW Parker Street/NW Lake Road
- NE Everett Street (SR 500)/SE Leadbetter Road
- NW Parker Street/NE 38th Avenue
- NE Everett Street (SR 500)/NE 43rd Avenue (WSDOT maintained)
- Site-Access Driveways

GREEN MOUNTAIN

CONCEPTUAL MASTER PLAN FOR A MIXED USE PRD

CAMSAS, WASHINGTON

GREEN MOUNTAIN LAND, LLC. 11/19/14

EXHIBIT B

TOTAL SITE AREA 283.3 AC

SITE AREA TABLE

R10 ZONE	119.7 AC
R6 ZONE	54.8 AC
MP10 ZONE	93.0 AC
CC ZONE	15.8 AC

RESIDENTIAL DENSITY CALCULATION

R-10	119.7 (0.43 / ACRES x 515 UNITS)
R-6	54.8 (0.72 / ACRES x 395 UNITS)
MP-10	93.0 (0.16 / ACRES x 595 UNITS)

TOTAL 1840 UNITS

DENSITY TABLE

POD	ACRES	APPROXIMATE LOT SIZE RANGE	MAXIMUM UNITS/LOTS
A	12.2 (R10-A1)	HD	219
B	15.5 (R1-6)	1000-3000	217
C	11.9 (C1-C2)	3000-5000	95
D	41.3 (R1-6)	4000-6000	389
E	26.5 (R1-6)	4200-7200	172
F	28.6 (R1-F1)	5250-9000	157
G	34.8 (R1-F1)	15,000-40,000	31
H	15.4 (CC)		100
TOTALS	181.4 AC		1300

*4% OF G (TOTAL 56 ACRES) TO BE PRESERVED OPEN SPACE

PARK & OPEN SPACE 49.5 + AC
 NEIGHBORHOOD CIRCULATOR 8.2 + AC
 ARTERIAL & COLLECTOR TRAFFIC DEDICATION (GOODWIN & INGLE) 1.8 + AC

--- URBAN VILLAGE AREA (A1, A2, A3, B5)
 A COMMERCIAL, MIXED USE AND RESIDENTIAL COMMUNITY CENTER (1.33.5 AC GROSS, 24.2 AC NET)

CIRCULATION COMPONENTS

ARTERIAL



COLLECTOR



NEIGHBORHOOD CIRCULATOR

LOCATED IN AREAS OF APPROXIMATELY 100 FEET WALKABILITY

NEIGHBORHOOD CONNECTOR

LOCATED IN AREAS OF APPROXIMATELY 100 FEET WALKABILITY

COMMUNITY ENTRIES & ACCESS POINTS

LOCATED IN AREAS OF APPROXIMATELY 100 FEET WALKABILITY

NOTE:

The proposed location and number of acres reflect the gross area approximated due to the preliminary nature of the design.

More specific location and number of acres will be determined after final zoning and planning documents are adopted.

The total number of lots on the proposed Green Mountain Master Plan will be determined after final zoning and planning documents are adopted.

More specific location and number of acres will be determined after final zoning and planning documents are adopted.



Plan provided by Western
Planning Associates,

11/19/14

Conceptual Master Plan
Camas, Washington

Figure
2

As required by the City of Camas, a transportation impact study was prepared to address the following transportation issues:

- Year 2014 existing land use and transportation system conditions within the site vicinity during the weekday a.m. and p.m. peak hours;
- Planned developments and transportation improvements in the study area;
- Trip generation and distribution estimates for the proposed development;
- Forecast year 2018 background traffic conditions without the proposed development during the weekday a.m. and p.m. peak hours;
- Forecast year 2018 total traffic conditions with the completion of Phase 1 of the proposed development during the weekday a.m. and p.m. peak hours;
- Forecast year 2029 background traffic conditions without the proposed development during the weekday a.m. and p.m. peak hours;
- Forecast year 2029 total traffic conditions with full build-out and occupancy of the proposed development during the weekday a.m. and p.m. peak hours;
- Level of service analyses for the study intersections; and
- On-site access and circulation.

Conclusions and recommendations are provided following the operational analysis.

ANALYSIS METHODOLOGY

All level of service analyses described in this report were performed in accordance with the procedures stated in the *2000 Highway Capacity Manual* (Reference 1). A description of level of service and the criteria by which they are determined is presented in *Appendix "A"*. *Appendix "A"* also indicates how level of service is measured and what is generally considered the acceptable range of level of service.

To ensure that this analysis was based on a reasonable worst-case scenario, the peak 15 minute flow rate during the peak hour analysis periods was used in the evaluation of all intersection levels of service. For this reason, the analysis reflects conditions that are only likely to occur for 15 minutes out of each average peak hour. Traffic conditions during other weekday hours and throughout the weekend will likely be better than those described in this report.

At the City of Vancouver-maintained NE 192nd Avenue/NE 13th Street intersection, the peak 15-minute flow rate was assessed by applying the peak 15-minute volume across the hour and not applying a peak hour factor in accordance with guidance provided by the City.

Operating Standards

The study intersections are each operated and maintained by one of three impacted jurisdictions: WSDOT, the City of Vancouver, or the City of Camas. Each of these jurisdictions has their own operating standards. WSDOT requires LOS "E" or better for non-HSS (Highways of Statewide Significance) in urban areas, City of Vancouver requires LOS "E" or better and a v/c ratio of less than 0.95 for signalized intersections. The City of Camas requires LOS "D" or better and a v/c ratio of 0.90 or better for all intersections. Table 1 lists the study intersections, the responsible jurisdiction, and the corresponding operating standard.

Table 1: Operating Standards at Study Intersections

ID	Study Intersection	Jurisdiction	Standard
1	NE 199 th Avenue/NE 58 th Street (SR 500)	WSDOT	LOS "C" for non-HSS in rural area ¹
2	NE 192 nd Avenue/NE 13 th Street	Vancouver	LOS "E" and v/c ratio less than 0.95
3	NW Friberg Street/NE Goodwin Road	Camas	LOS "D" and v/c of 0.90 or better
4	NE Ingle Road/NE Goodwin Road	Camas	LOS "D" and v/c of 0.90 or better
5	NE 232 nd Avenue/NE 28 th Street	Camas	LOS "D" and v/c of 0.90 or better
6	NE 242 nd Avenue (SR 500)/NE 28 th Street	WSDOT	LOS "C" for non-HSS in rural area ¹
7	NW Friberg Street/NW Lake Road	Camas	LOS "D" and v/c of 0.90 or better
8	NW Parker Street/NW Lake Road	Camas	LOS "D" and v/c of 0.90 or better
9	NE Everett Street (SR 500)/SE Leadbetter Road	WSDOT	LOS "C" for non-HSS in rural area ¹
10	NW Parker Street/NE 38 th Avenue	Camas	LOS "D" and v/c of 0.90 or better
11	NE Everett Street (SR 500)/NE 43 rd Avenue	WSDOT	LOS "C" for non-HSS in rural area ¹

¹The City of Camas TIF Update applied the WSDOT standard for facilities in urban areas (LOS "E" for non-HSS in urban area). Based on conversations with WSDOT, the standard for rural areas is currently applicable to the WSDOT study intersections.

Source: City of Camas Traffic Impact Fee Update (Reference 2)

Turn Lane Guidelines

For roadways under Washington State jurisdiction, such as SR 500, WSDOT has defined traffic-volume based turn lane guidelines within the *WSDOT Design Manual* (Reference 3). Left-turn lane guidelines are provided in section 1310.04(2)(a) while right-turn lane guidelines are provided in section 1310.04(3).

EXISTING CONDITIONS

The existing conditions analysis identifies site conditions and the current operational and geometric characteristics of roadways within the study area. These conditions will be compared with future conditions later in this report.

The site of the proposed development and surrounding study area was visited and inventoried in March 2014. At that time, information was collected regarding site conditions, adjacent land uses, existing traffic operations, and transportation facilities in the study area.

Site Conditions and Adjacent Land Uses

The area encompassed by the master plan site is largely undeveloped. The southwest corner of the property is occupied by the Green Mountain Golf Course, a portion of which is proposed to remain open after completion of the Phase 1 master plan development. The areas surrounding the site are also largely undeveloped, with a few single family homes situated along NE 28th Street, NE 199th Avenue, and SR 500.

Transportation Facilities

Table 2 provides a summary of key transportation facilities in the site vicinity and Figure 3 illustrates the existing lane configurations and traffic control devices at the study intersections.

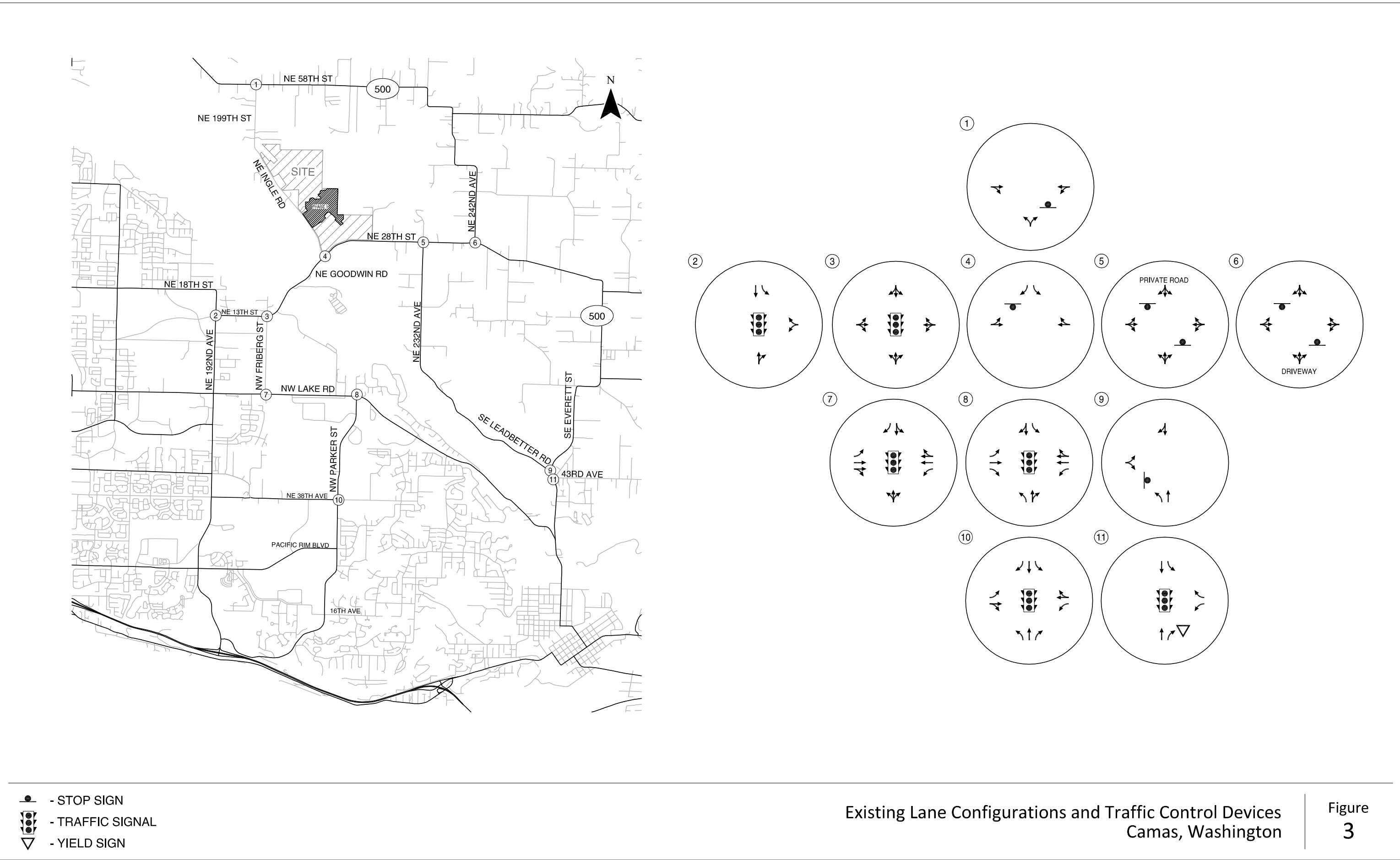


Table 2: Existing Transportation Facilities and Roadway Designations

Roadway	Classification ¹	Cross-Section	Speed Limit (mph)	Side-Walks?	Bicycle Lanes?	Median?	On-Street Parking?
NE 13 th Street / NE Goodwin Road / NE 28 th Street	Arterial	5-lane	40	Yes	Yes	Yes	None
SR 500	Non-HSS ²	2-lane	50	None	None	None	None
NE Ingle Road / NE 199 th Avenue	Collector	2-lane	50	None	None	None	None
NE 192 nd Avenue	Arterial	2-lane	40	Partial	None	None	None
SE 192 nd Avenue	Arterial	5-lane	40	Partial	None	None	None
NW Friberg Street / NE 202 nd Avenue	Arterial	2-lane	40	Partial	None	None	None
SE 1 st Street / NW Lake Road	Arterial	5-lane	40	Yes	Yes	Yes	None
NW Parker Street	Arterial	5-lane	35	Yes	Yes	None	None
NE Everett Road	Arterial	2-lane	35	None	None	None	None
NW Pacific Rim Blvd./ SE 34 TH Street	Arterial	5-lane	40	Yes	None	Yes	None

¹ Source: City of Camas Traffic Impact Fee Update (Reference 2)

² HSS = Highways of Statewide Significance

Pedestrian and Bicycle Facilities

Neither sidewalks nor striped bicycle facilities are provided in the vicinity of the site on either NE Ingle Road or NE Goodwin Road/NE 28th Street.

Transit Facilities

The C-Tran *Camas Connector* Dial-A-Ride service currently operates within a portion of the study area, with a northern boundary of Lake Road, western boundary of Parker Street, and eastern boundary of SR 500. This service operates by accepting telephone calls from riders to be taken to a location inside a defined boundary. The hours of operation are Monday through Friday from 5:30 a.m. to 9:15 a.m. and 2:00 p.m. to 7:00 p.m. No service is available on holidays (Reference 4).

Crash Analysis

The crash histories of the study intersections were reviewed in an effort to identify potential intersection safety issues. Crash records were obtained from WSDOT. The data represents records between January 1, 2008 and November 30, 2013. The crash rate was calculated to determine the number of crashes per million entering vehicles (MEV). Generally speaking, a crash rate greater than 1.0 crashes per MEV suggests locations where crash patterns should be reviewed in greater detail.

A brief discussion of the crash data at key intersections is presented after Table 3. There were no fatalities reported at the study intersections during the time periods studied. *Appendix "B" contains the crash data.*

As shown in Table 3, the two intersections where the highest crash rates were observed were NE 199th Avenue/NE 58th Street and NE Ingle Road/NE Goodwin Road. At all other intersections, the observed crash rates are well below 1.0 crash per million entering vehicles.

Table 3: Intersection Crash Histories (1/1/2008 - 11/30/2013)

Intersection	Total	Collision Type						Severity		Crash Rate Crashes/ MEV ²
		Rear End	Turn -ing	Angle	Pedes -trian	Fixed Object	Road way Ditch	PDO ¹	Injury	
1. NE 199 th Ave / NE 58 th St (SR 500)	7	0	0	4	0	3	0	5	2	0.57
2. NE 192 nd Ave / NE 13 th St	8	1	6	0	0	1	0	4	4	0.27
3. NE Friberg St / NE Goodwin Rd	5	1	3	1	0	0	0	3	2	0.32
4. NE Ingle Rd / NE Goodwin Rd	16	4	0	5	1	4	2	11	5	1.03
5. NE 232 nd Ave / NE 28 th St	3	0	0	1	0	2	0	2	1	0.25
6. NE 242 nd Ave (SR 500)/ NE 28 th St	4	0	0	2	0	1	1	2	2	0.30
7. NW Friberg St / NW Lake Rd	6	3	0	1	0	2	0	6	0	0.24
8. NW Parker St / NW Lake Rd	3	0	1	0	0	2	0	3	0	0.12
9. NE Everett St (SR 500)/ SE Leadbetter Rd	5	0	0	0	0	3	2	2	3	0.54
10. NW Parker St / NE 38 th Ave	9	0	5	4	0	0	0	6	3	0.29
11. NE Everett St (SR 500) / NE 43 rd Ave	7	1	5	0	0	1	0	3	4	0.36

¹ PDO = Property Damage Only | ² MEV = Million Entering Vehicles

NE 199th Avenue/NE 58th Street (SR 500)

The second highest crash rate, 0.57, occurs at the intersection of NE 199th Avenue/NE 58th Street. There have been seven reported collisions, including four angle collisions and three fixed-object collisions at this intersection. The crash data was reviewed in an effort to identify potential trends. Three of the angle crashes involved vehicles making a northbound left turn from NE 199th Avenue to NE 58th Street; another involved an eastbound vehicle turning right from NE 58th Street to NE 199th Avenue. Of the three fixed object collisions, two involved utility poles and one involved a domestic animal. Collisions with domestic animals are challenging to eliminate and one of the collisions with the utility poles involved a driver asleep at the wheel. Four of the seven crashes occurred during wet road surface conditions. Given the relatively low number of reported collisions

and the unusual nature of three of the seven collisions (the three fixed-object collisions), there are no safety-based mitigation measures recommended at this intersection at this time in conjunction with site development. If an eastbound right-turn lane is added to the intersection in the future (which is currently warranted as will be described later in this report), it may provide safety benefits.

NE Ingle Road/NE Goodwin Road

The highest crash rate, 1.03, occurs at the intersection of NE Ingle Road/NE Goodwin Road. There have been reported collisions including 4 four rear-end collisions, 5 five angle collisions, 4 fixed-object collisions (involving a utility pole, a mailbox, a boulder, and a wood sign post), 2 roadway ditch collisions, and a pedestrian collision at this intersection. As discussed later in this report, the Green Mountain Master Plan proposes to construct an exclusive eastbound left-turn lane on NE Goodwin Road at NE Ingle Road in conjunction with the Phase 1 site development. Providing an eastbound left-turn lane and potential related reconfiguration of the southbound stop bar location (refer to sight distance discussion below) in conjunction with Phase 1 site development could provide a safety benefit at this intersection.

Two of the angle collisions involved vehicles exceeding reasonably safe speeds while making a westbound right-turn at the intersection. One of the recommended mitigation measures for the 2029 full build-out scenario of the proposed development is the addition of a westbound right-turn lane at this intersection, which could provide a safety benefit for turning vehicles. Additional long-term mitigation measures anticipated in conjunction with site development include constructing a three-lane roadway section on NE Goodwin Road along the site frontage and signalizing the intersection when warranted.

Intersection Sight Distance

Intersection sight distance was observed at the study intersections and was found to meet applicable city or WSDOT standards, with the exception of the sight distance at the NE Ingle Road/NE Goodwin Road intersection. As shown in Exhibit 1 below, the stop bar on NE Ingle Road is set back approximately 25 feet from the edge of NE Goodwin Road.

Exhibit 1: Stop Bar on NE Ingle Road at NE Goodwin Road

Image source: Google Maps (right image)

As indicated in Exhibit 2, vehicles currently pull past the stop bar to obtain sufficient sight distance to then execute a turning maneuver. Regardless of the proposed site development, we recommend that the City of Camas consider potential improvements to enhance the intersection sight distance, such as relocating the stop bar closer to NE Goodwin Road.

Exhibit 2: Vehicle Waiting to Make Left-Turn from NE Ingle Road to NE Goodwin Road

Existing Traffic Operations

Manual turning-movement counts were conducted at the study intersections in March and April 2014. The counts were conducted on a typical mid-week day during the morning peak period (7:00 to 9:00 a.m.) and the evening peak period (4:00 to 6:00 p.m.) per City requirements. Individual Intersection peak hours were then identified for operational analysis purposes.

Figures 4 and 5 provide a summary of the existing turning-movement counts, which are rounded to the nearest five vehicles per hour for the weekday a.m. and p.m. peak hours, respectively. *Appendix "C" contains the traffic count worksheets used in this study.*

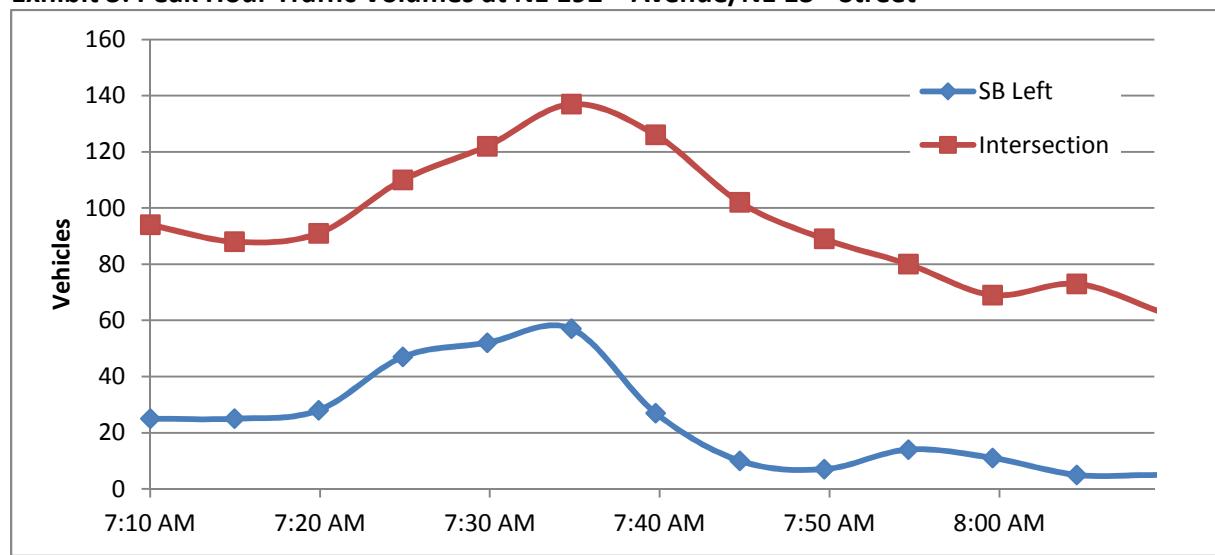
As shown in Figures 4 and 5, the study intersections operate acceptably during both study periods. *Appendix "D" contains the existing conditions traffic operations worksheets.*

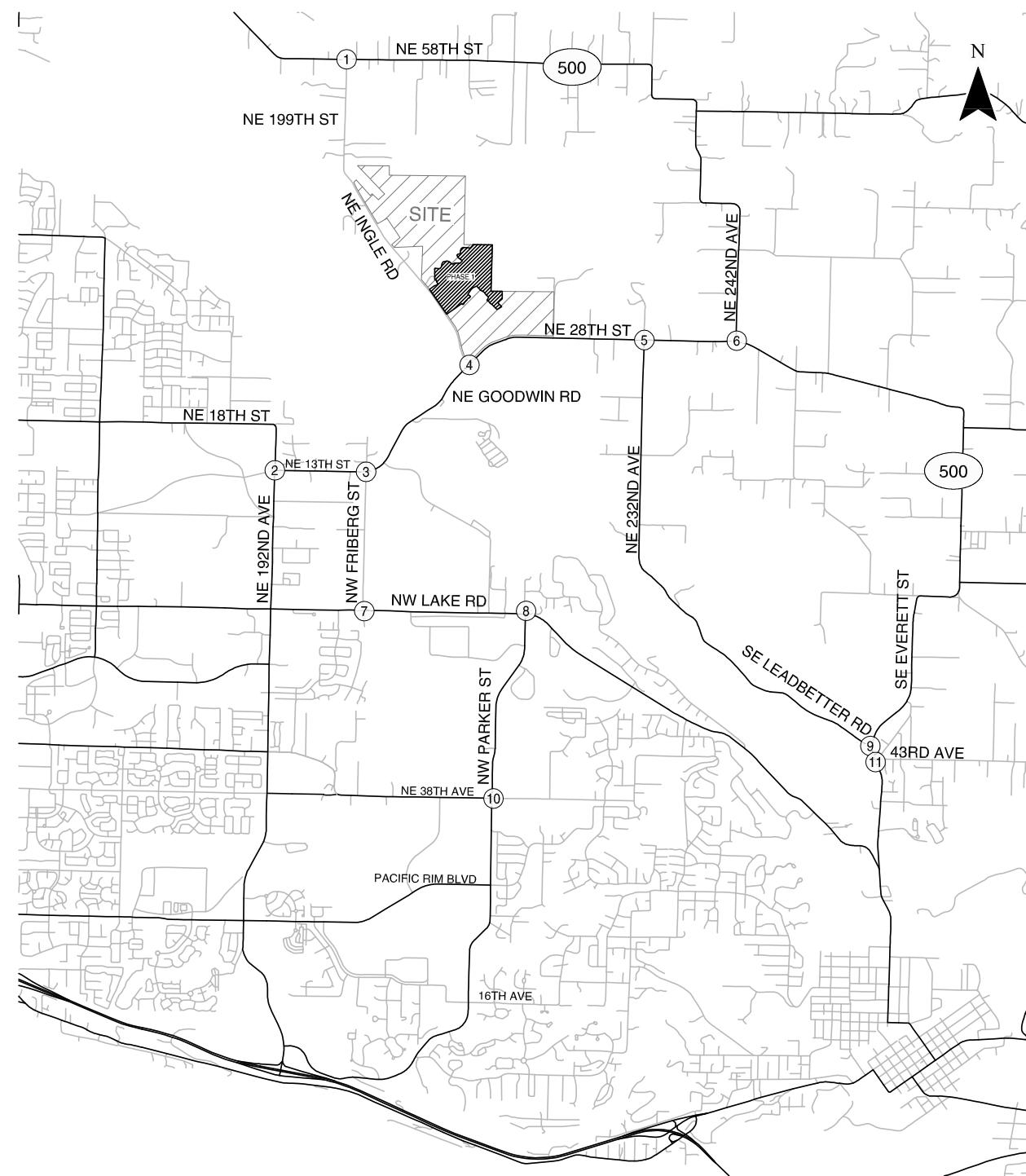
Operations at NE 192nd Avenue / NE 13th Street

As noted in the "Analysis Methodology" section, analysis of the City of Vancouver-maintained NE 192nd Avenue/NE 13th Street intersection involved application of the peak 15-minute flow rate across the hour and not applying a peak hour factor. This analysis methodology is in accordance with guidance provided by the City.

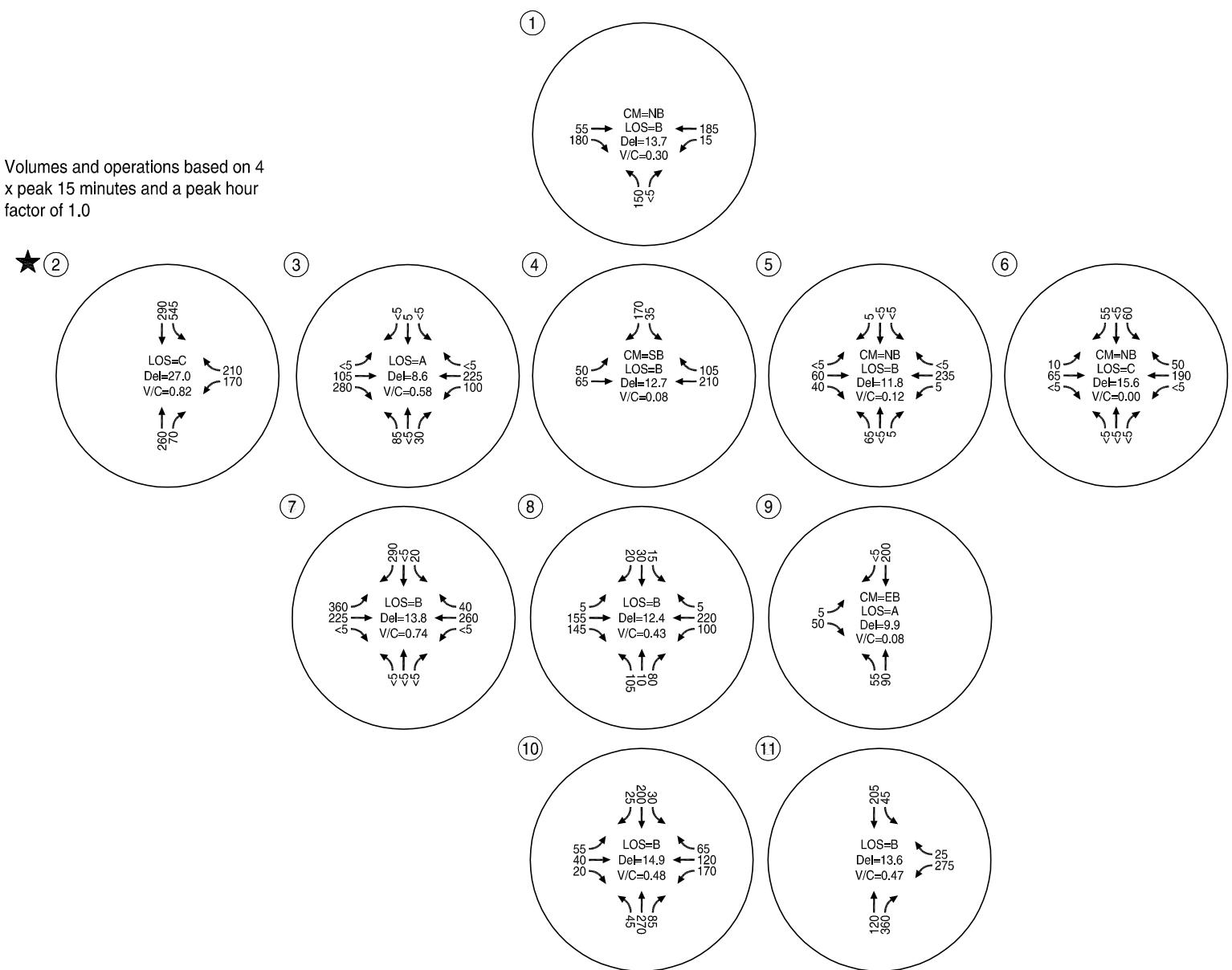
During the weekday AM peak hour, significant peaking occurs at the intersection related to vehicles accessing Union High School on NW Friberg Street. In particular, the southbound left-turning volume peaks in advance of the school start at 7:45 AM, as shown in Exhibit 3. During this "peak of the peak" period, queueing for the southbound left-turn lane sometimes exceeds the available striped storage (approximately 160 feet). Based on field observation, heightened delays and queueing for the southbound left-turn movement are contained to about fifteen minutes in advance of the school start, during which time some southbound left-turning vehicles do not clear through the intersection during each cycle. After this time, volumes decrease significantly and left-turning vehicles consistently clear through the intersection in a single cycle.

Exhibit 3: Peak Hour Traffic Volumes at NE 192nd Avenue/NE 13th Street





★ Volumes and operations based on 4 x peak 15 minutes and a peak hour factor of 1.0



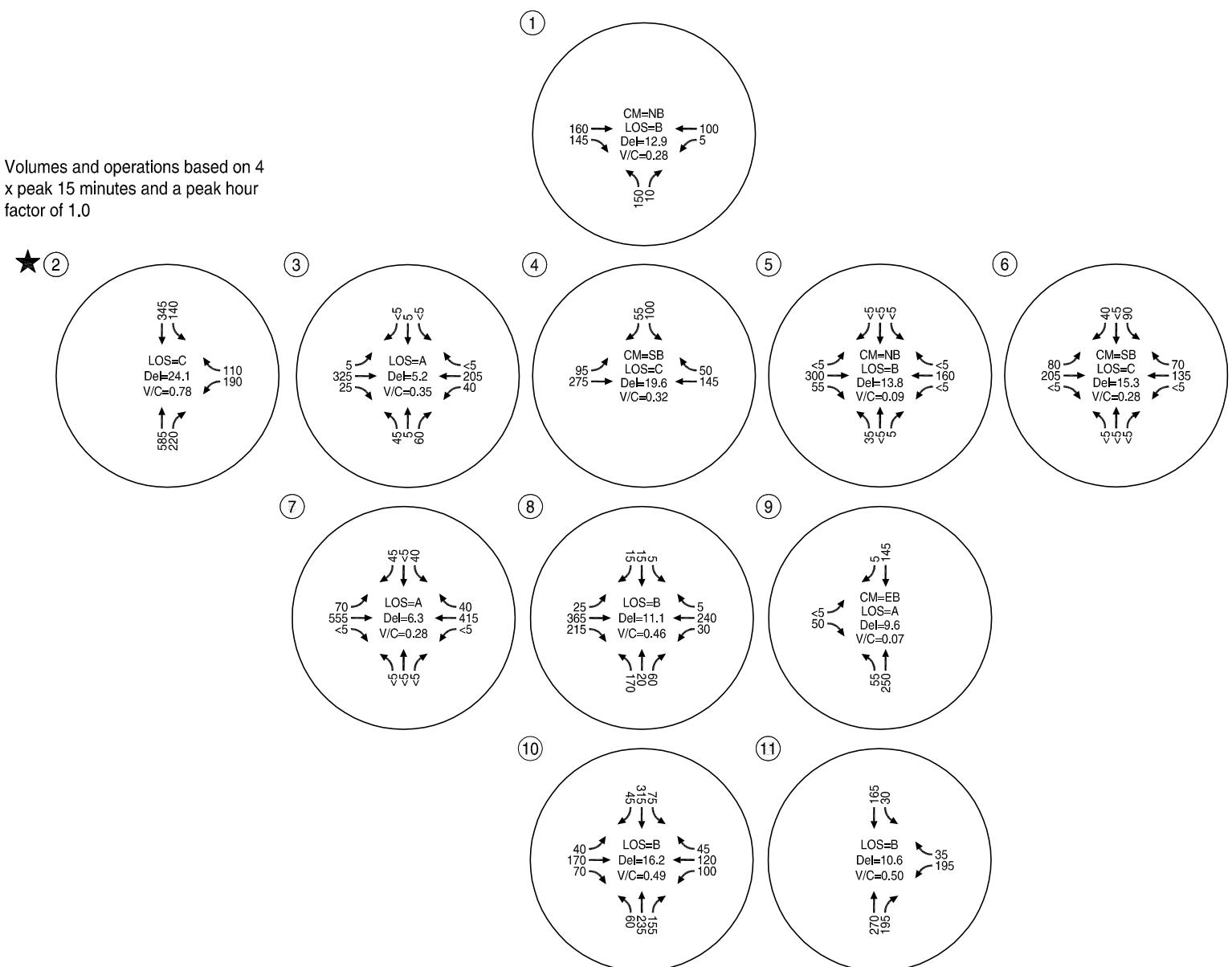
CM = CRITICAL MOVEMENT (TWSC)
 LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT
 LEVEL OF SERVICE (TWSC)
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 MOVEMENT CONTROL DELAY (TWSC))
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
 TWSC = TWO-WAY STOP CONTROL

Existing Intersection Operations
Weekday AM Peak Hour
Camas, Washington

Figure
4



★ Volumes and operations based on 4 x peak 15 minutes and a peak hour factor of 1.0



CM = CRITICAL MOVEMENT (TWSC)
 LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT
 LEVEL OF SERVICE (TWSC)
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL
 MOVEMENT CONTROL DELAY (TWSC))
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
 TWSC = TWO-WAY STOP CONTROL

Existing Intersection Operations
Weekday PM Peak Hour
Camas, Washington

Figure
5

TRAFFIC IMPACT ANALYSIS

The traffic impact analysis identifies how the study area's transportation system will operate upon phased build-out of the proposed master plan site. A horizon year of 2018 was selected to assess conditions with build-out of Phase 1 while a 15-year 2029 horizon year was assumed for site build-out. The impact of site-generated weekday a.m. and p.m. peak hour trips was examined as follows:

- Planned developments and transportation improvements in the study area were identified and accounted for;
- Trip generation and distribution estimates for the proposed development were prepared for Phase 1 and full build-out of the proposed development;
- Forecast year 2018 background traffic conditions without the proposed development were analyzed at the study intersections;
- Forecast year 2018 total traffic conditions with completion of Phase 1 of the proposed development were analyzed at the study intersections;
- Forecast year 2029 background traffic conditions without the proposed development were analyzed at the study intersections;
- Forecast year 2029 total traffic conditions with full build-out and occupancy of the proposed development were analyzed at the study intersections; and
- On-site circulation and site-access operations were evaluated.

Proposed Development Plan

Green Mountain Land, LLC is proposing to master plan the 283-acre site with mixed-use development. Green Mountain Golf Course is currently located on a large portion of the master plan property. We understand that a portion of the existing Green Mountain Golf Course may remain temporarily available for use after completion of Phase 1 site development and that, ultimately, the golf course will be closed prior to full master plan build-out. No effort has been made to account for "credit" for existing trips to and from the golf course for the purposes of this transportation impact analysis report.

The master plan proposes eight phases of development, with the sequence and timing of phases to be finalized pending market conditions. It is expected that Phase 1 will be completed by 2018 and full master plan build-out is assumed by 2029 for traffic impact assessment purposes. A mix of residential and commercial uses is planned in accordance with the zoning, with a mixed use village proposed to better integrate the commercially zoned portion of the property. The application seeks

approval of an overlay zone for a portion of the site intended for an urban village. The village would be located at the southwest corner of the project and will encompass approximately twenty-four acres.

For traffic impact study purposes, Phase 1 is assumed to consist of a residential component with 215 single-family detached homes. Full build-out of the master plan residential component assumed construction of up to 536 apartment units and 764 single-family detached homes. The retail portion of the proposed development plan was assumed to develop after Phase 1 and was assumed to be a 90,000 square-foot shopping center for trip generation purposes¹.

Access to Phase 1 development is anticipated along NE Ingle Road, with additional access added to NE Goodwin Road during later stages of the development. Final details of the number and location of site access points will be defined during preparation of individual site plan applications, therefore appropriate planning level assumptions have been made for master planning purposes. The proposed master plan anticipates two public street neighborhood circulator connections to NE Goodwin Road serving the site in conjunction with two public street neighborhood circulator connections along NE Ingle Road. The commercial site is expected to have direct driveway access to NE Ingle Road. Some residential areas (not individual residence driveways) not served by the anticipated neighborhood circulator facilities may also seek direct access to NE Ingle Road or NE Goodwin Road as appropriate.

Trip Generation

Trip generation estimates for the proposed development were generated based on information provided in the standard reference manual *Trip Generation, 9th Edition* published by the Institute of Transportation Engineers (ITE – Reference 7). The internal and pass-by trip rates applied to each land use were also determined from ITE's *Trip Generation, 9th Edition*. Table 4 summarizes the daily, weekday a.m., and weekday p.m. peak-hour trips for the Phase 1 assumed development while Table 5 summarizes the complete master plan site trip generation estimate. All daily trips have been rounded to the nearest ten and all peak hour trips have been rounded to the nearest five trips.

¹ The unit mix for phase 1 and buildout was developed based on a reasonable worst-case scenario. Final development may result in a less-intense mix of residential units.

Table 4: Trip Generation Estimate – Phase 1

Land Use	ITE Code	Size	Daily	Weekday AM Peak Hour			Weekday PM Peak Hour		
				Total	In	Out	Total	In	Out
Single-Family Detached Housing	210	215 units	2,050	160	40	120	215	135	80

Table 5: Trip Generation Estimate – Build-out (Includes Phase 1)

Land Use	ITE Code	Size	Daily	Weekday AM Peak Hour			Weekday PM Peak Hour		
				Total	In	Out	Total	In	Out
Apartment	220	536 units	3,570	275	55	220	330	215	115
Single-Family Detached Housing	210	764 units	7,270	575	145	430	765	480	285
Total Residential (1,300 units)			10,840	850	200	650	1,095	695	400
<i>Internalization (6% Daily, 5% PM)</i>			630	0	0	0	60	30	30
Shopping Center	820	90,000 square feet	6,340	145	90	55	560	270	290
<i>Internalization (10% Daily, 11% PM)</i>			630	0	0	0	60	30	30
<i>Pass-By Trips (34%)</i>			1,940	50	25	25	170	85	85
<i>Total Trips</i>			17,180	995	290	705	1,655	965	690
<i>Less Internalization</i>			1,260	0	0	0	120	60	60
<i>Less Pass-by trips</i>			1,940	50	25	25	170	85	85
<i>Net New Trips for Full Build-out</i>			13,980	945	265	680	1,365	820	545

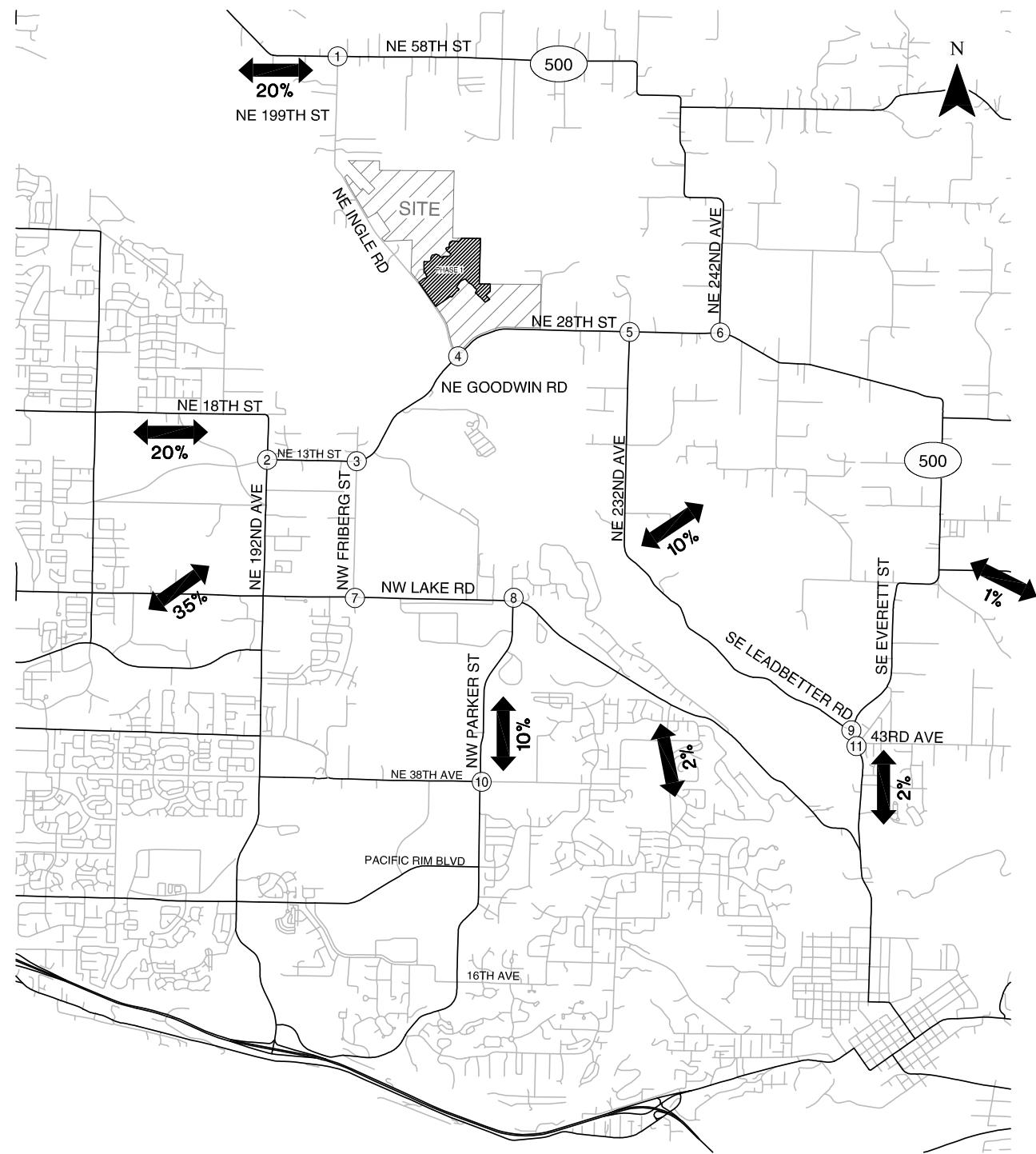
Trip Distribution

The distribution of site-generated trips onto the study area roadway system was estimated based on a review of surrounding roadway characteristics, existing uses, the 2035 travel demand model maintained by the Southwest Washington Regional Transportation Council (RTC), and review agency guidance. Trip distribution patterns were developed separately for the residential and retail trips. Figure 6 illustrates the trip distribution patterns for the residential and retail trips.

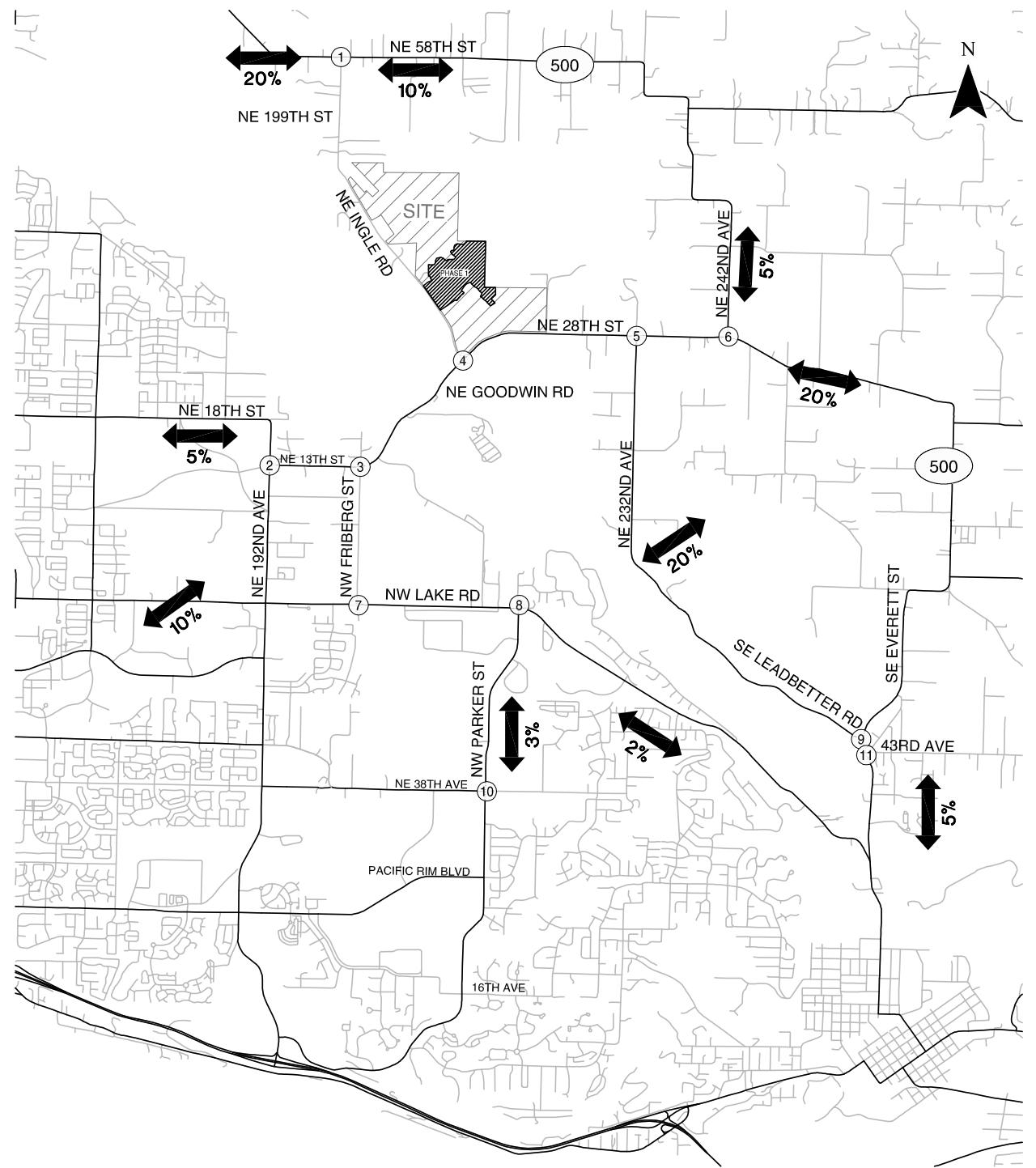
Trip Assignment

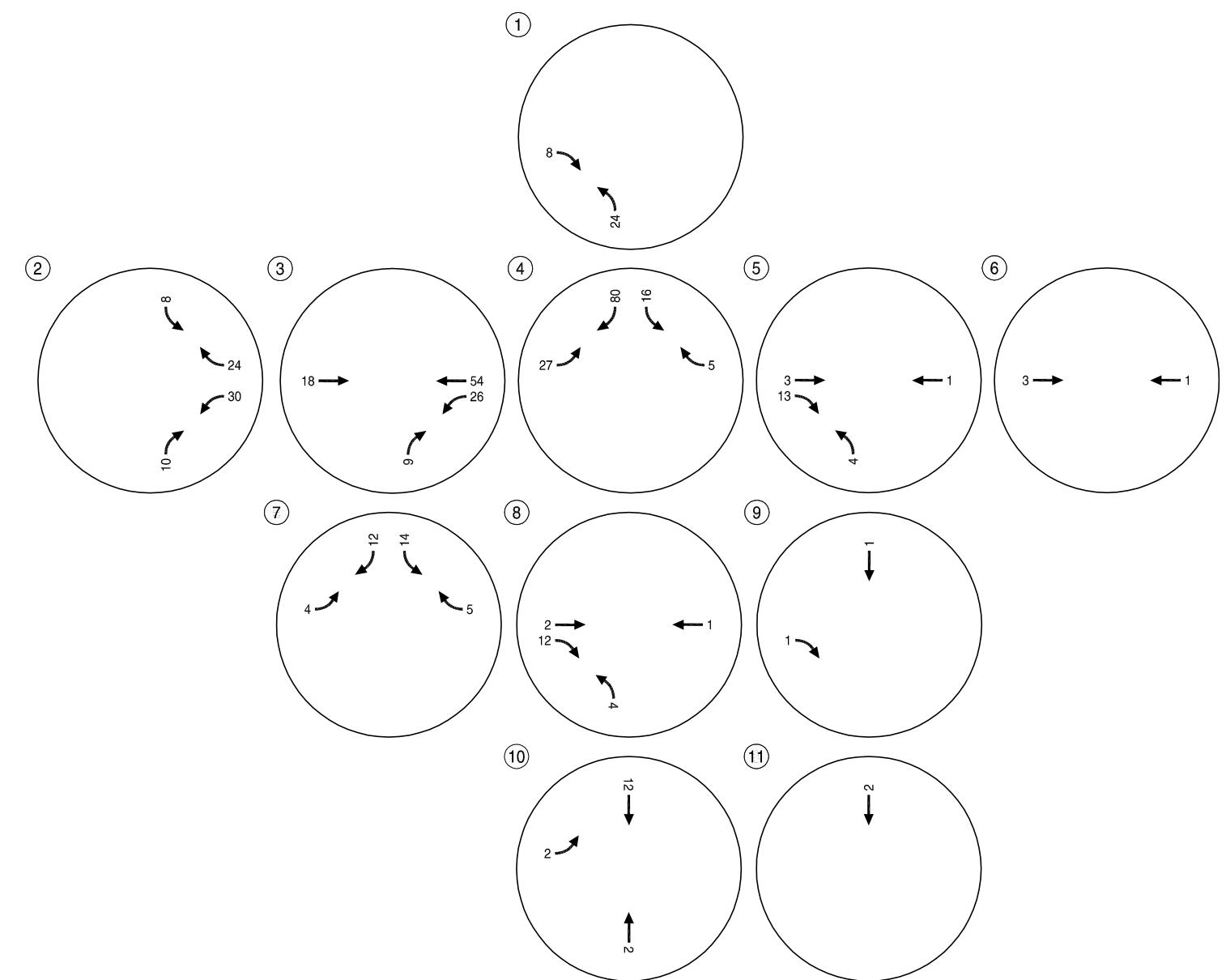
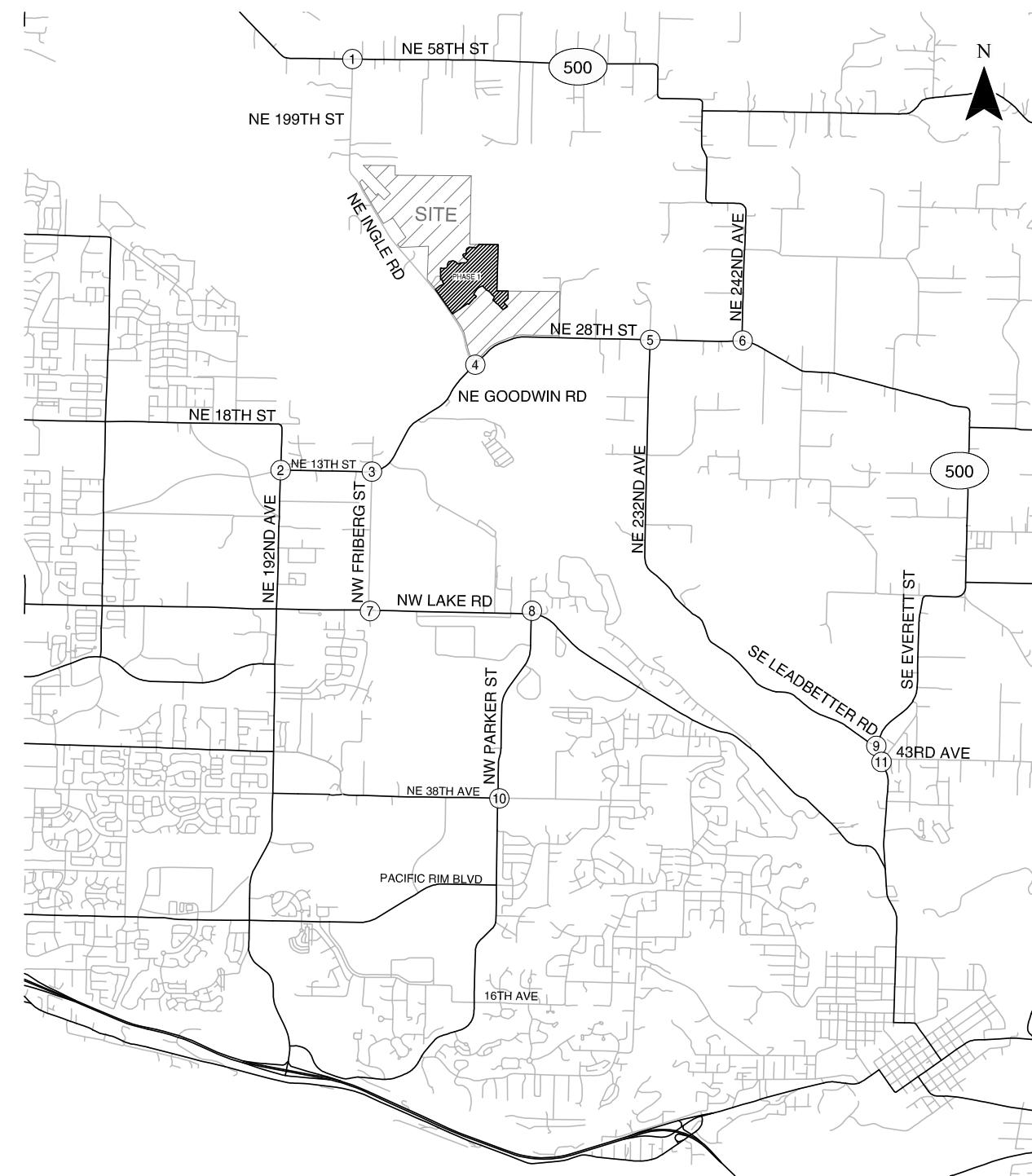
The weekday a.m. and p.m. peak hour site trips shown in Tables 4 and 5 were assigned to the roadway network based on the trip distribution patterns shown in Figure 6. Figures 7 through 10 show the assignment of site-generated trips during the weekday a.m. and p.m. peak hours for Phase 1 and at Build-out. Note that the site-generated build-out volumes shown in Figures 9 and 10 include the Phase 1 site-generated trips and thus reflect the total number of trips generated. A figure showing the assignment of pass-by trips is provided in Appendix "E".

RESIDENTIAL DISTRIBUTION:



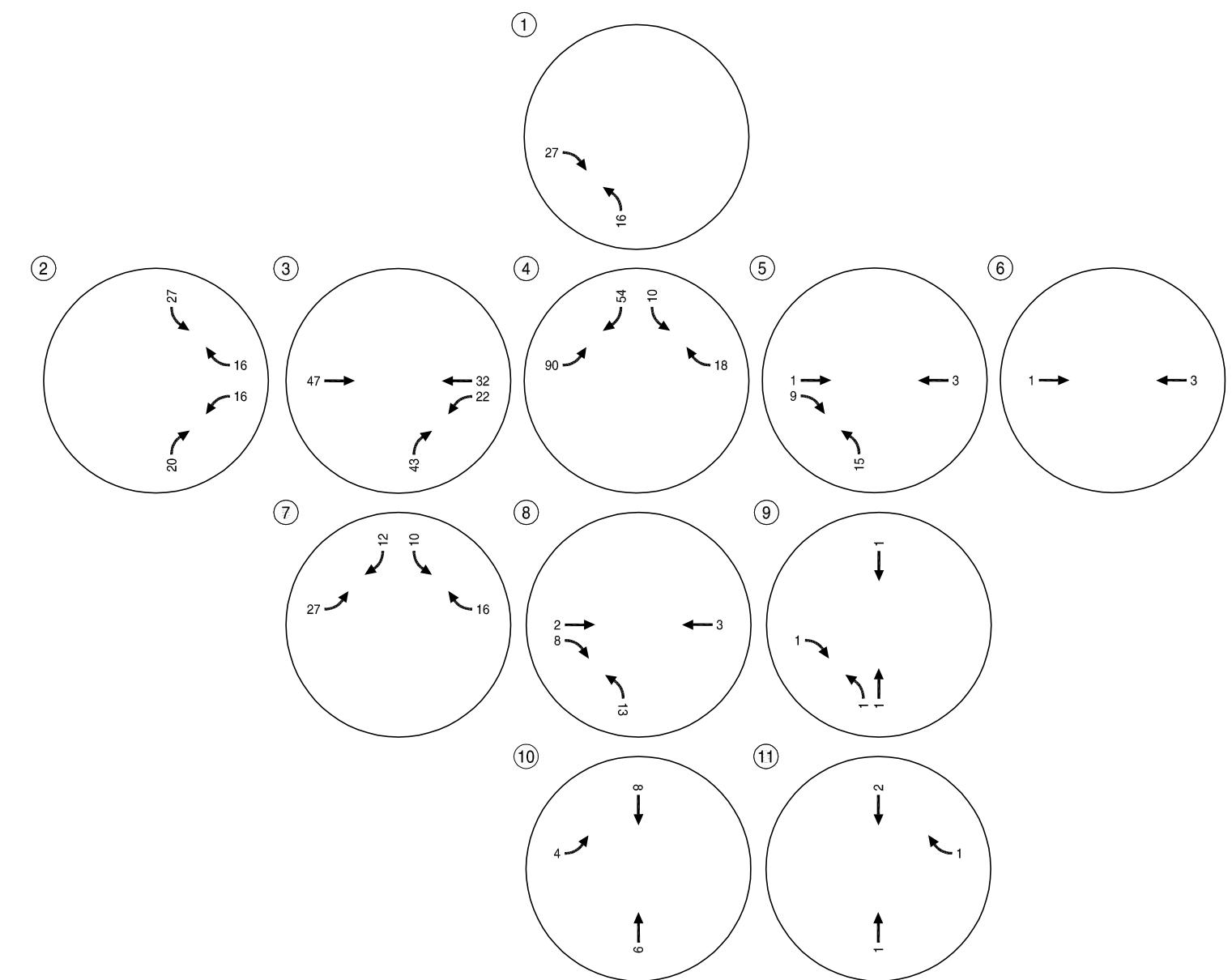
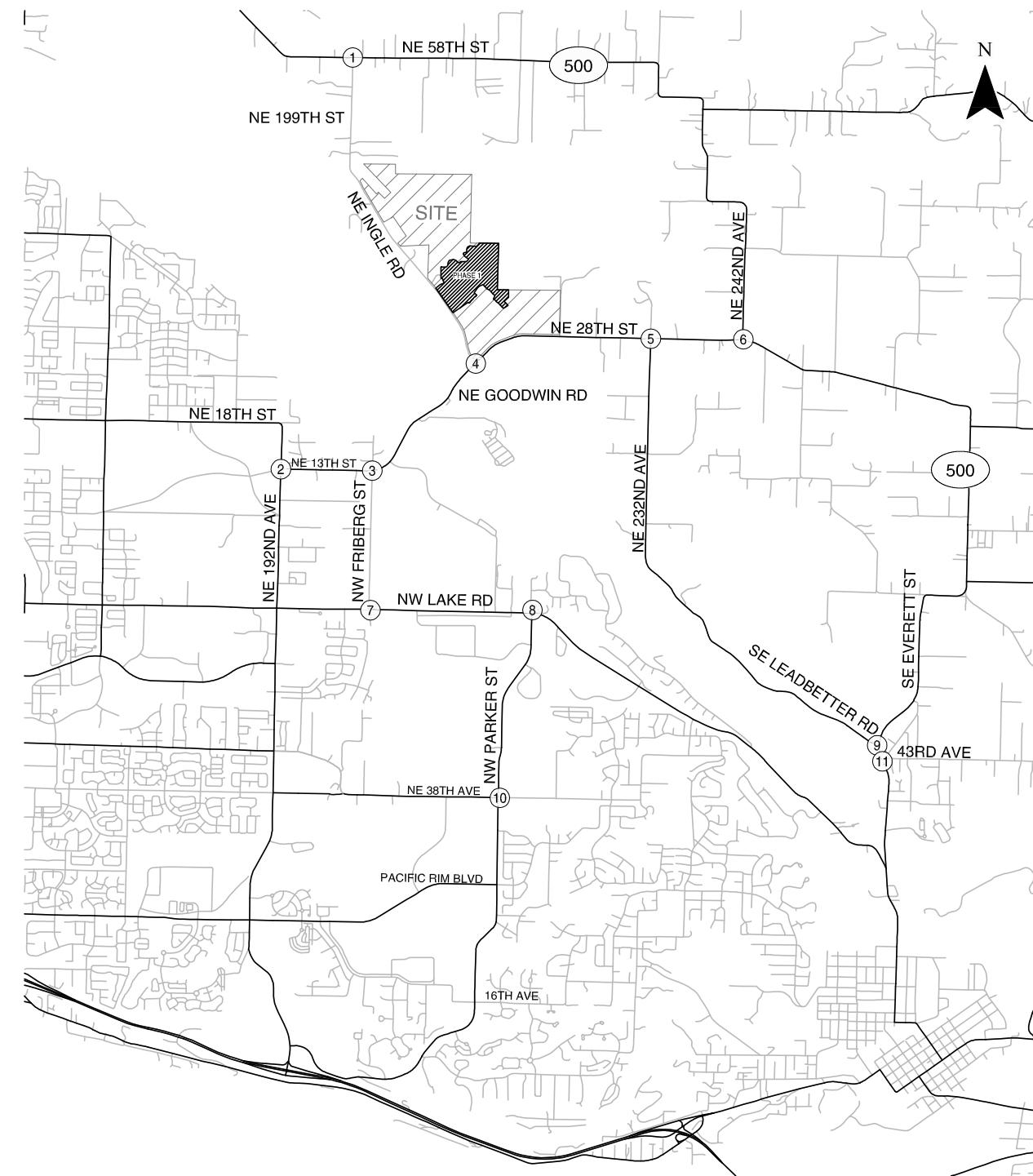
RETAIL DISTRIBUTION:

Estimated Trip Distribution Pattern
Camas, WashingtonFigure
6



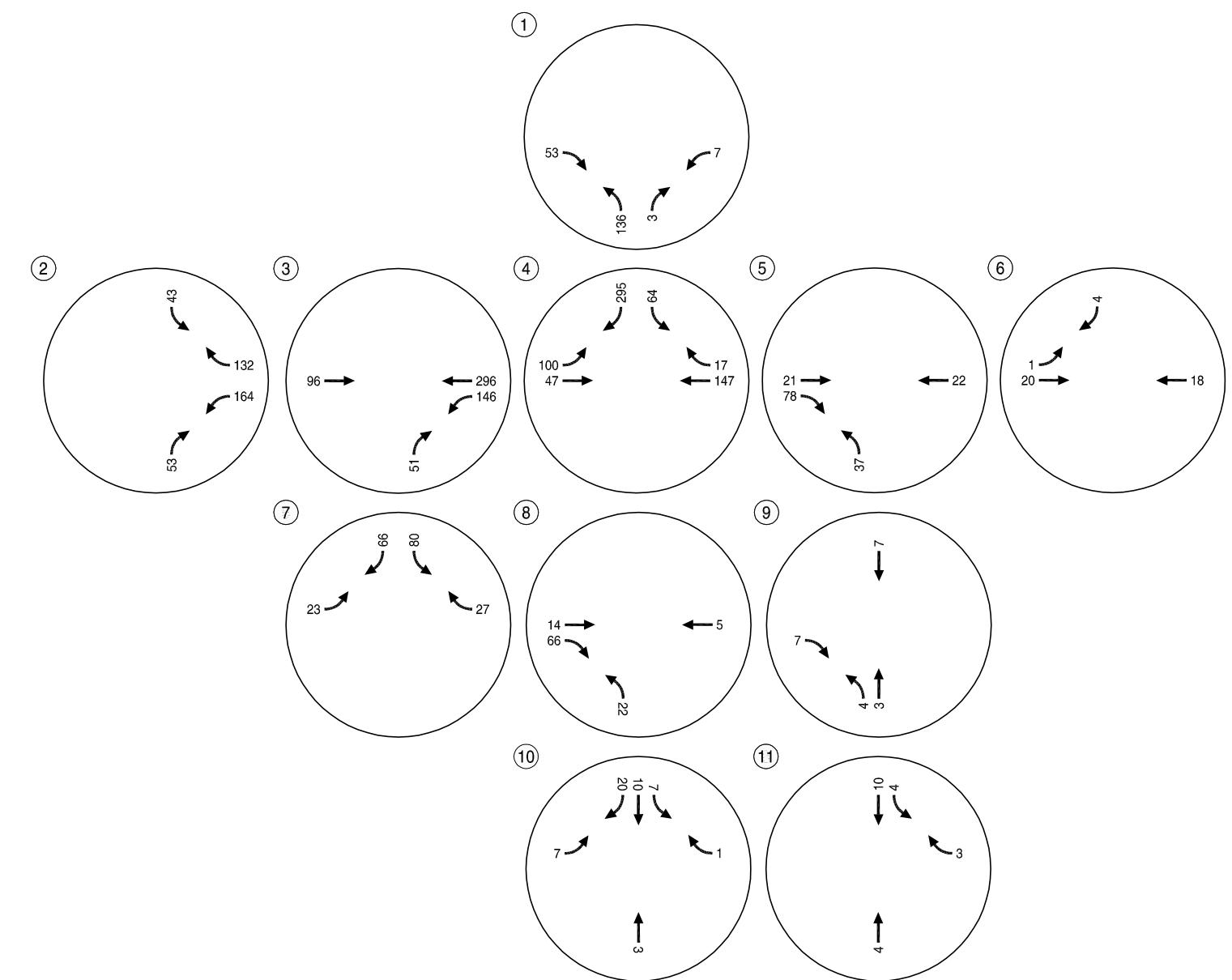
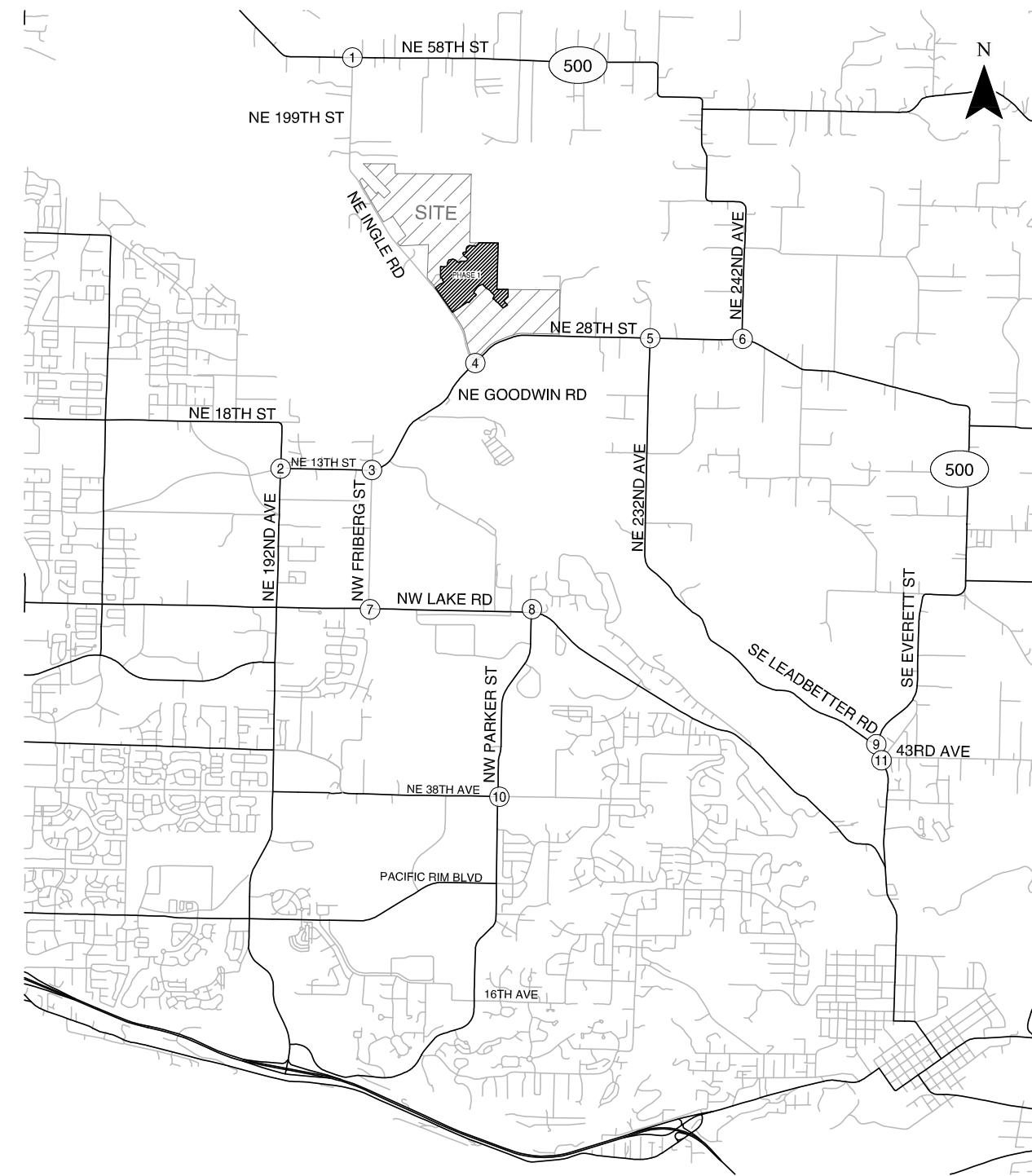
Total Estimated Trip Assignment - Phase 1
Weekday AM Peak Hour
Camas, Washington

Figure
7



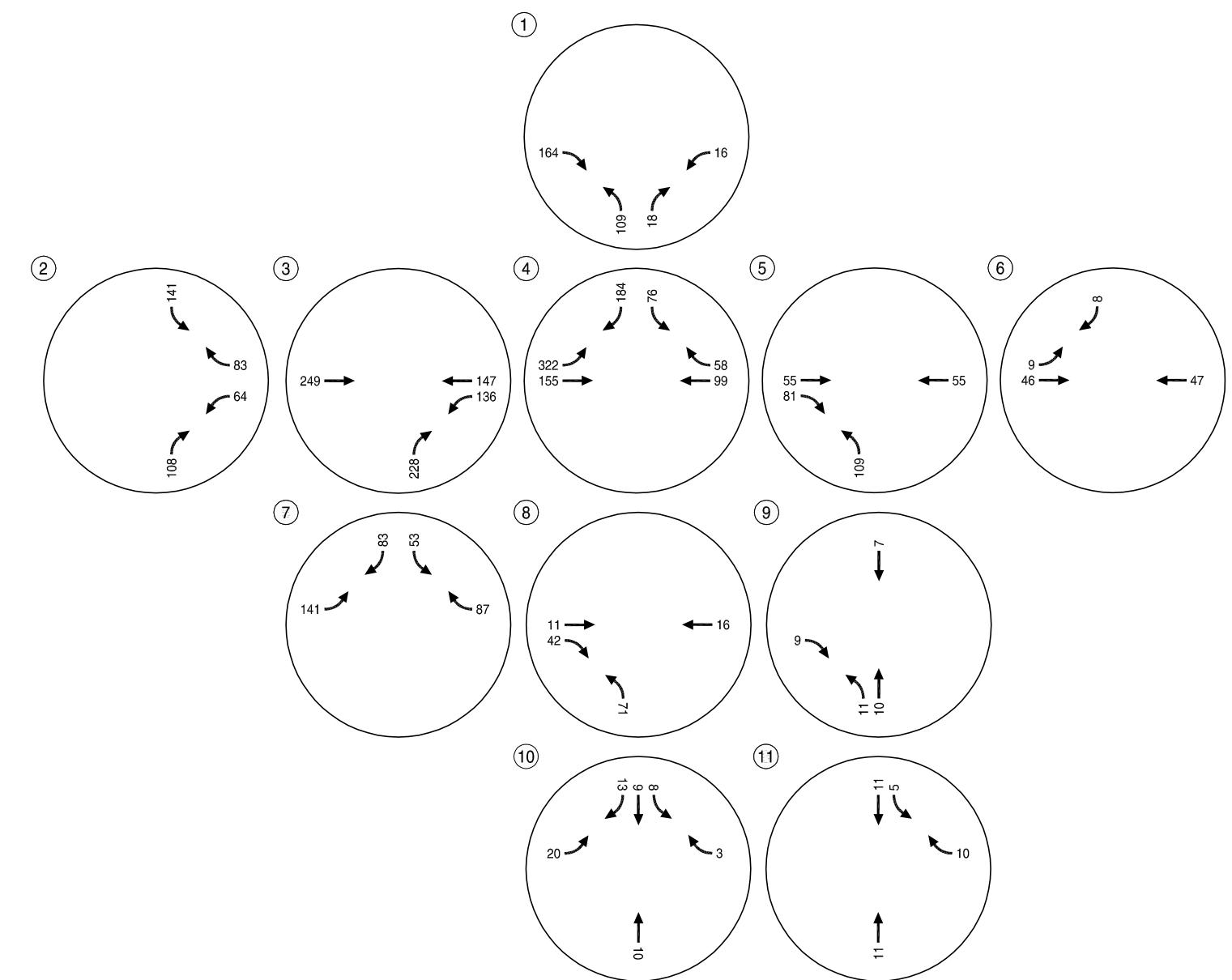
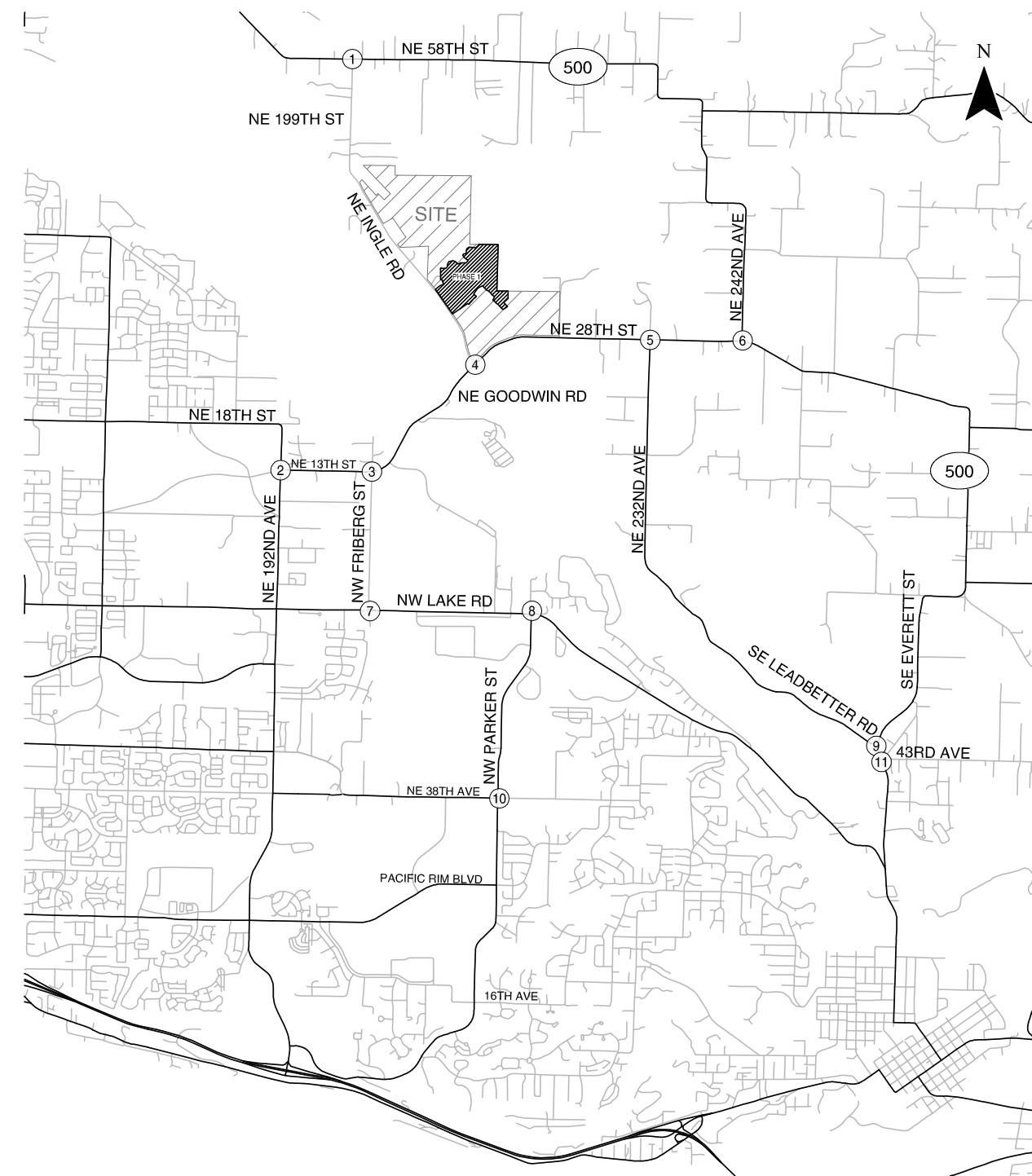
Total Estimated Trip Assignment - Phase 1
Weekday PM Peak Hour
Camas, Washington

Figure
8



Total Estimated Trip Assignment - Full Build-Out
Weekday AM Peak Hour
Camas, Washington

Figure
9



Total Estimated Trip Assignment - Full Build-Out
Weekday PM Peak Hour
Camas, Washington

Figure
10

2018 Background Traffic Conditions

The 2018 background traffic analysis projects how the study area's transportation system will operate during the year that Phase 1 of the proposed development is expected to be completed. This analysis includes traffic growth due to previously approved in-process developments within the study area, but does not include traffic from any of the proposed Green Master Plan development phases. Per agency direction, no growth was applied to City of Camas roadways and a 2% growth rate was applied to City of Vancouver roadways (Reference 8).

Planned Developments and Transportation Improvements

City of Camas staff identified 13 local development projects that are approved but not yet occupied. These in-process developments include:

- Lake Hills
- Two Creeks
- The Summit at Columbia Vista
- Parker Village
- The Hills at Round Lake
- North Hills Subdivision
- Brady Road Subdivision
- Deerhaven Subdivision
- Hadley's Glen
- Millshore Downs
- Fisher Creek Campus
- Lacamas Prairie
- 192nd Plaza West

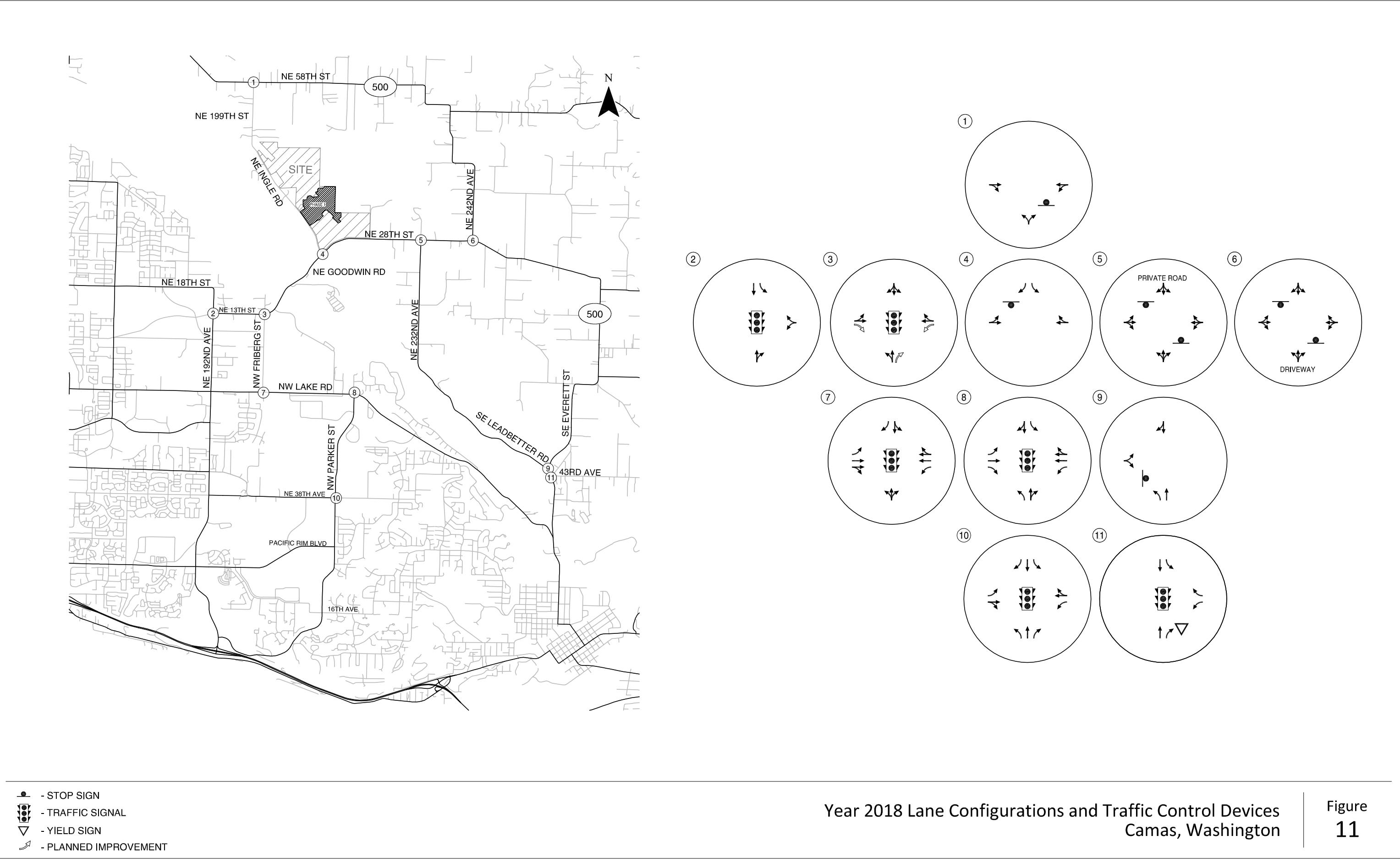
Appendix "F" contains the data received pertaining to the in-process trips.

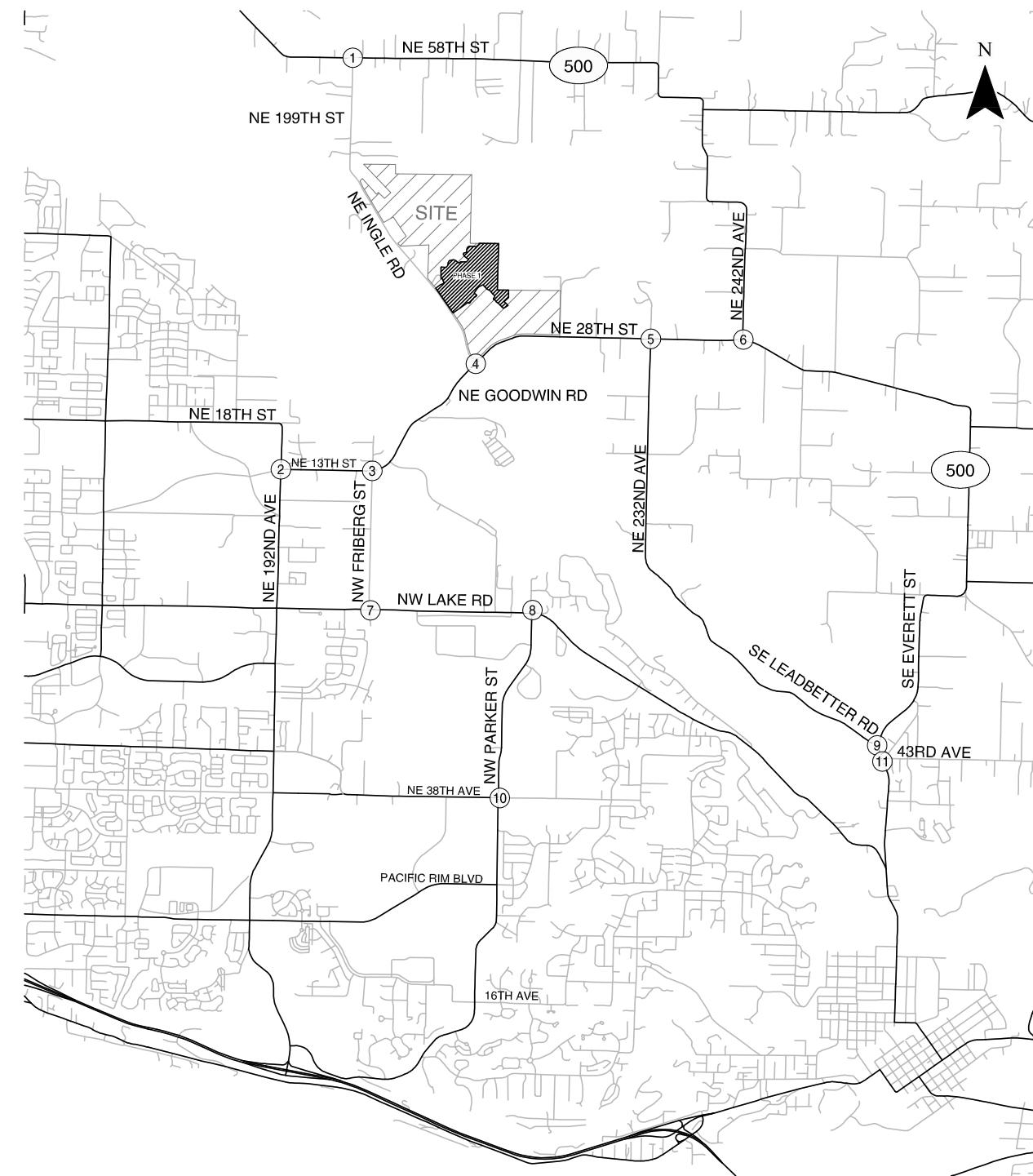
Planned and funded transportation improvements within the study area include the widening of NW Friberg Street (between Lake Road and NE 13th Street) and the addition of a westbound left-turn lane, northbound right-turn lane, and eastbound right-turn lane at the NW Friberg Street/NE Goodwin Road intersection. Figure 11 shows the lane configuration and traffic control devices assumed in the 2018 analysis.

Traffic Operations

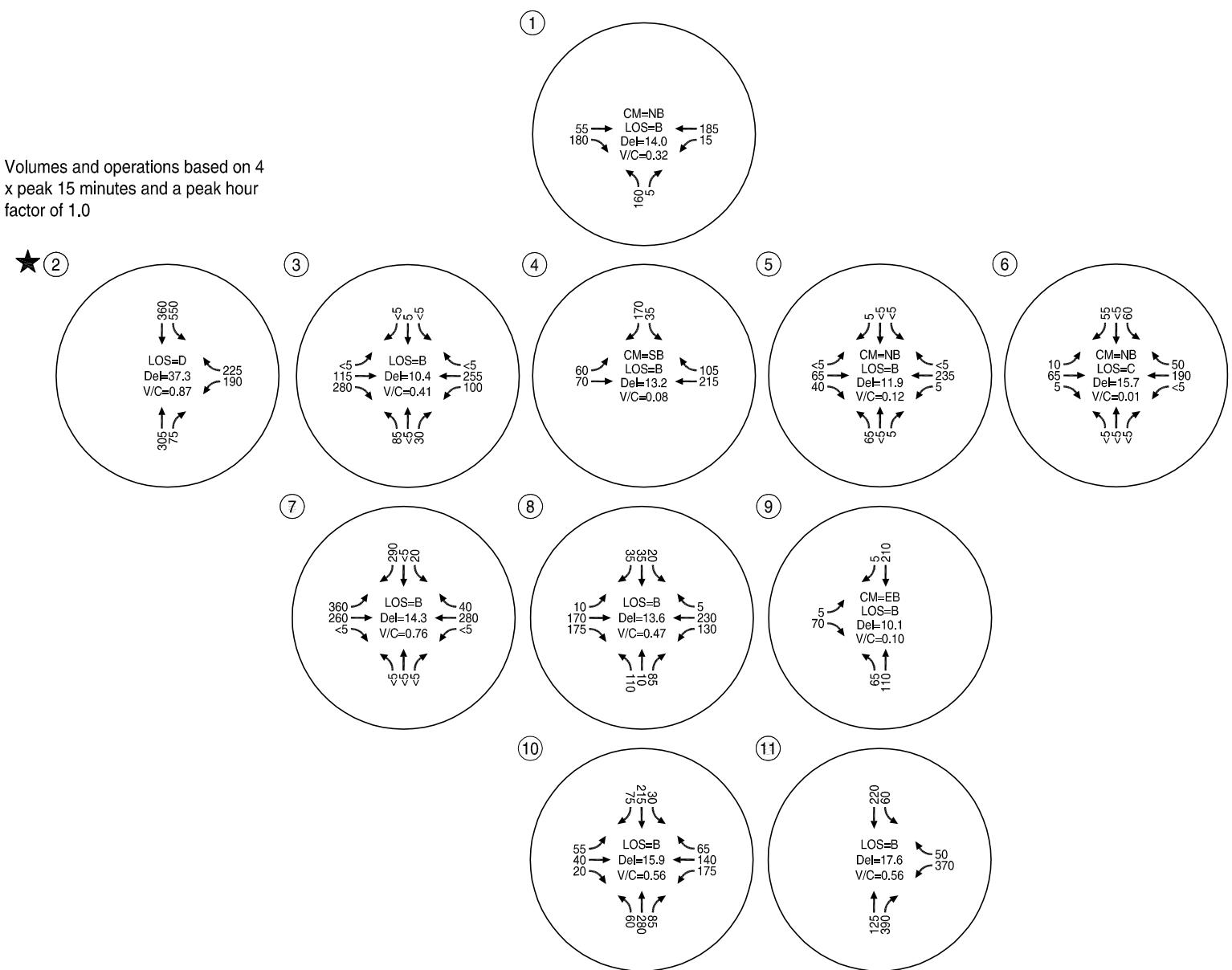
Figures 12 and 13 summarize the year 2018 background traffic operations analysis results at the study intersections for the weekday a.m. and weekday p.m. peak-hours, respectively. The projected turning movement counts are rounded to the nearest five vehicles per hour. As shown, the study intersections operate acceptably during the weekday a.m. and weekday p.m. peak periods in the 2018 background conditions.

Appendix "G" contains the 2018 background conditions traffic operations worksheets.





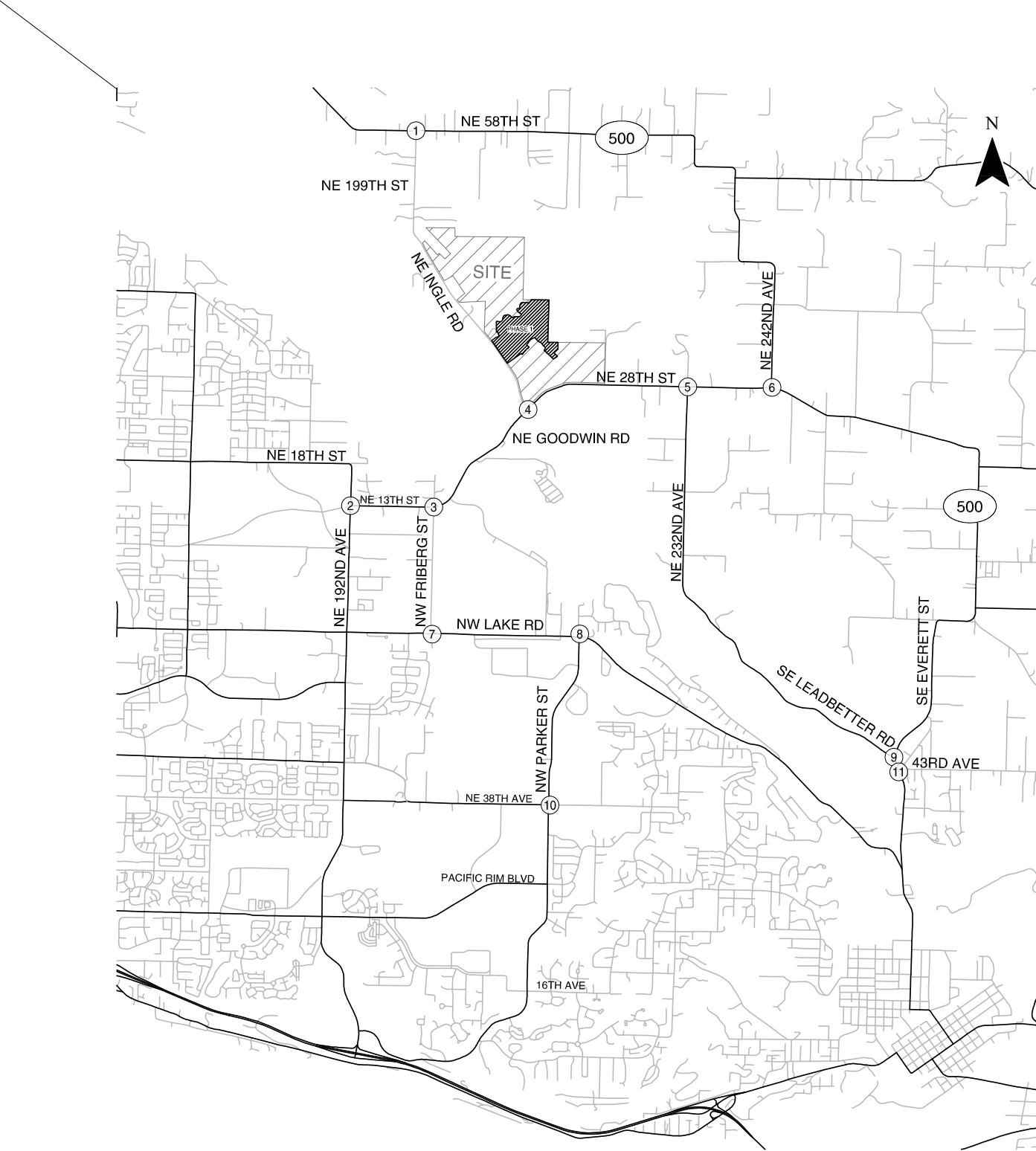
★ Volumes and operations based on 4 x peak 15 minutes and a peak hour factor of 1.0



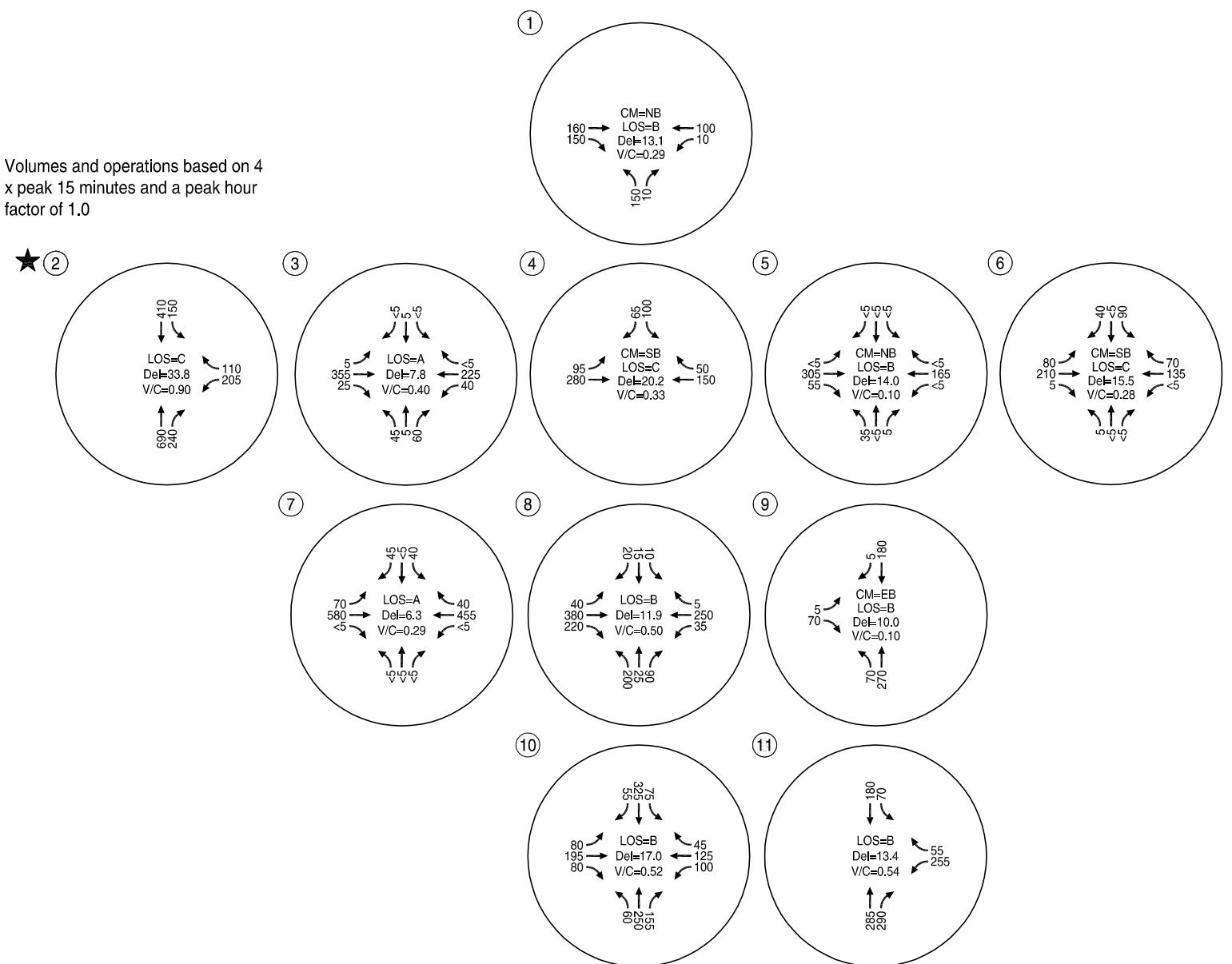
CM = CRITICAL MOVEMENT (TWSC)
 LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT
 LEVEL OF SERVICE (TWSC)
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL
 MOVEMENT CONTROL DELAY (TWSC))
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
 TWSC = TWO-WAY STOP CONTROL

2018 Background Conditions
 Weekday AM Peak Hour
 Camas, Washington

Figure
 12



★ Volumes and operations based on 4 x peak 15 minutes and a peak hour factor of 1.0



CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT
LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL
MOVEMENT CONTROL DELAY (TWSC))
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2018 Background Conditions
Weekday PM Peak Hour
Camas, Washington

Figure
13

2018 Total Traffic Conditions

The year 2018 total traffic analysis forecasts how the study area's transportation system will operate with the addition of traffic from Phase 1 of the proposed development. Phase 1 site-generated trips were added to the 2018 background traffic volumes at the study intersections to arrive at the total traffic volumes.

All lane configurations are consistent with background conditions with the exception of the intersection of NE Ingle Road/NE Goodwin Road. The developer proposes to construct an exclusive eastbound left-turn lane on NE Goodwin Road at NE Ingle Road in conjunction with the Phase 1 site development. Consequently, provision of the turn lane was assumed for the total traffic analysis.

Traffic Operations

Figures 14 and 15 summarize the year 2018 total traffic operations analysis results at the study intersections for the weekday a.m. and weekday p.m. peak-hours, respectively. The projected turning movement counts are rounded to the nearest five vehicles per hour. As shown, all but one of the study intersections are forecast to operate acceptably during the weekday a.m. and p.m. peak periods under 2018 total traffic conditions. The southbound movement at the intersection of NE Ingle Road/NE Goodwin Road is anticipated to operate at a LOS E during the weekday p.m. peak hour. Operations at this intersection could be mitigated with the addition of an eastbound right-turn lane. Based on a sensitivity analysis, this mitigation is triggered by the 203rd unit to be constructed. Up until this point, the southbound left-turn lane is forecast to operate at a LOS D. Table 6 provides the operations at NE Ingle Road/NE Goodwin Road during the weekday PM peak hour supporting the sensitivity analysis.

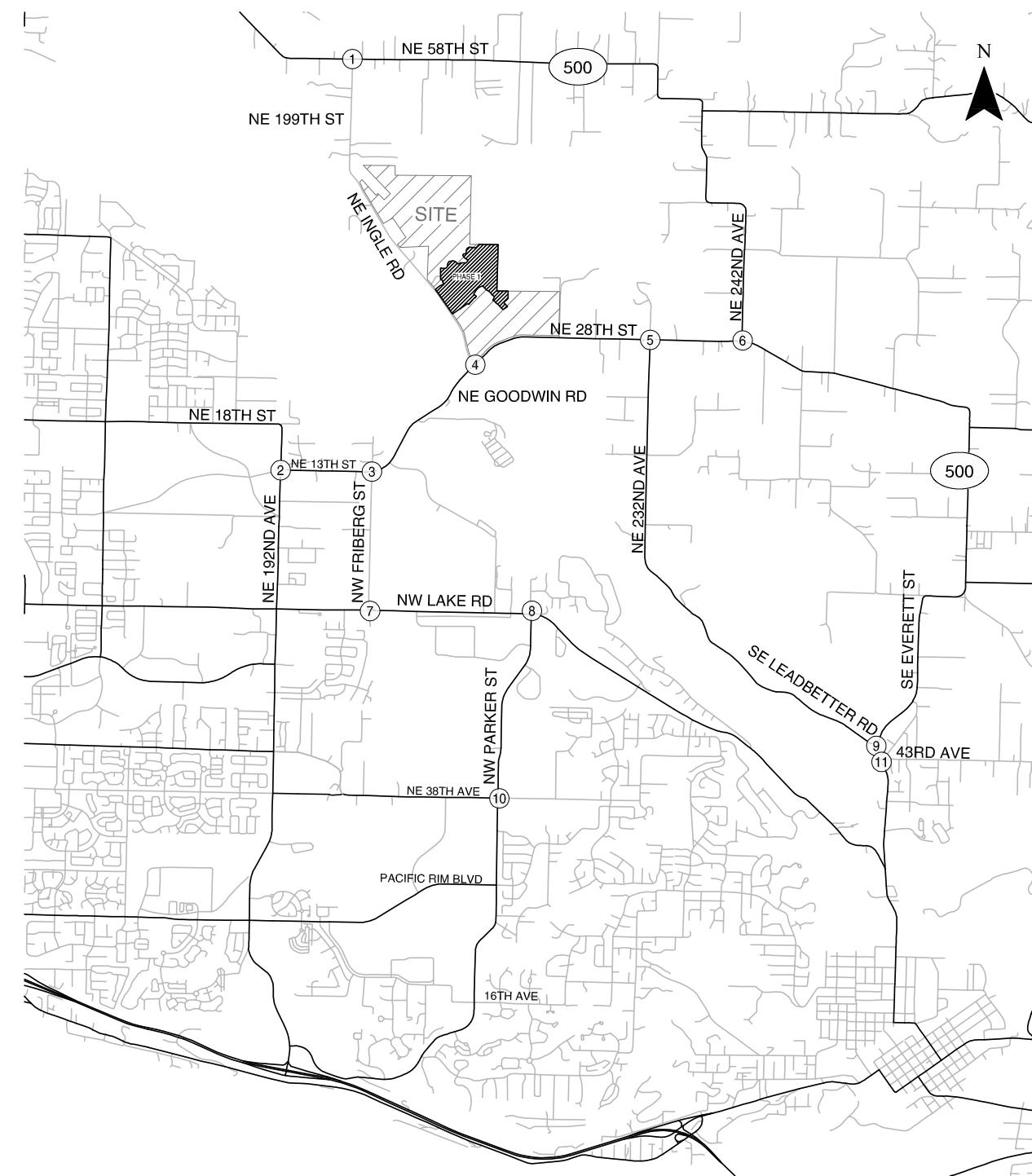
Table 6: NE Ingle Road/NE Goodwin Road Operations Assessment – weekday PM peak hour

Scenario	Critical Movement	LOS	v/c ratio
2018 Background Conditions	SBL	C	0.33
2018 Background + 200 Homes	SBL	D	0.52
2018 Background + 203 homes	SBL	E	0.53
2018 Total Traffic (215 homes)	SBL	E	0.53
2018 Total Traffic (2015 homes) – mitigated ¹	SBL	D	0.51

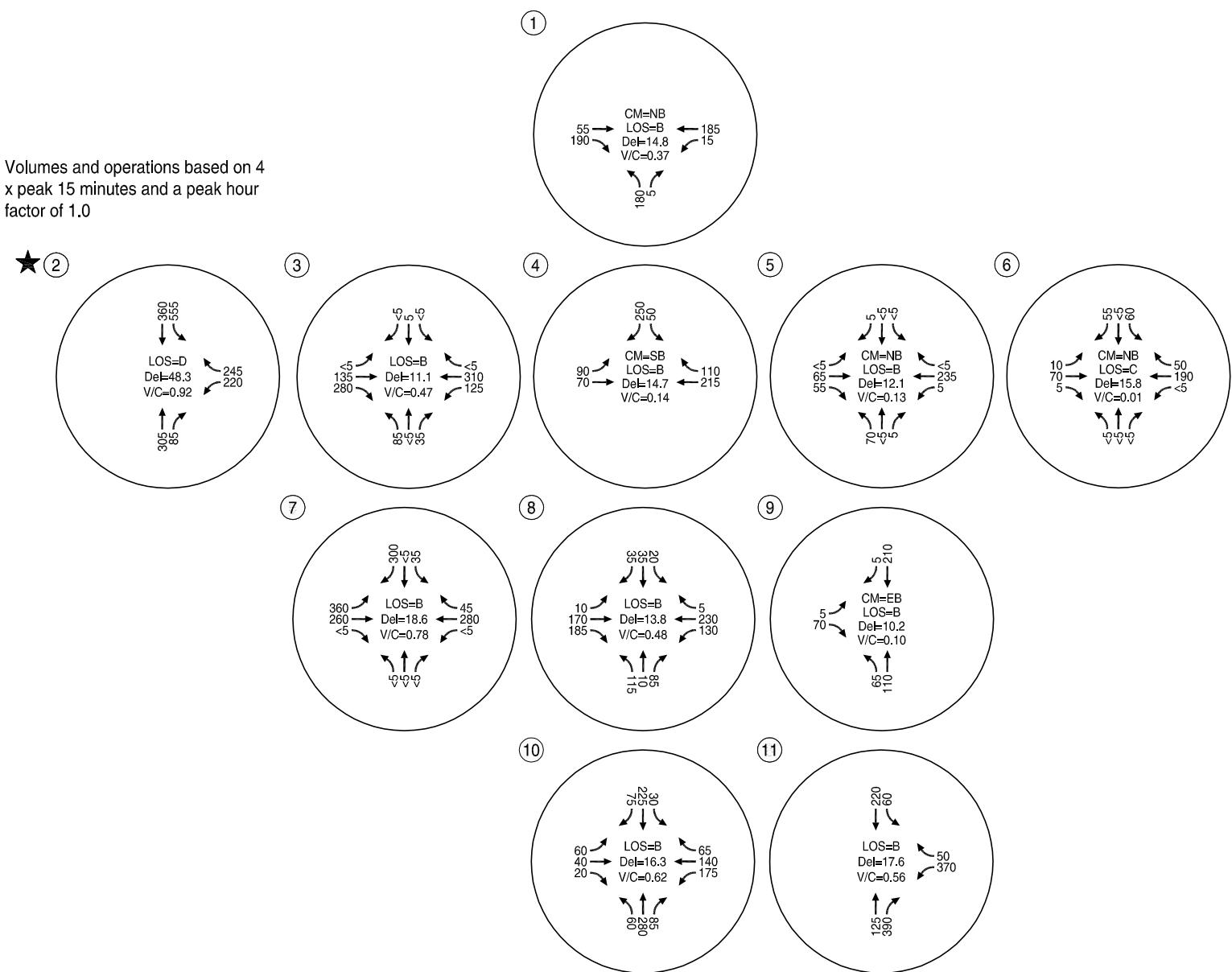
Notes: LOS = Level of Service; v/c ratio = volume-to-capacity ratio

¹Mitigation includes provision of westbound right-turn lane

Appendix "H" contains the 2018 total traffic conditions traffic operations worksheets. Appendix "I" contains the traffic operations worksheets supporting the sensitivity analysis at NE Ingle Road/NE Goodwin Road.



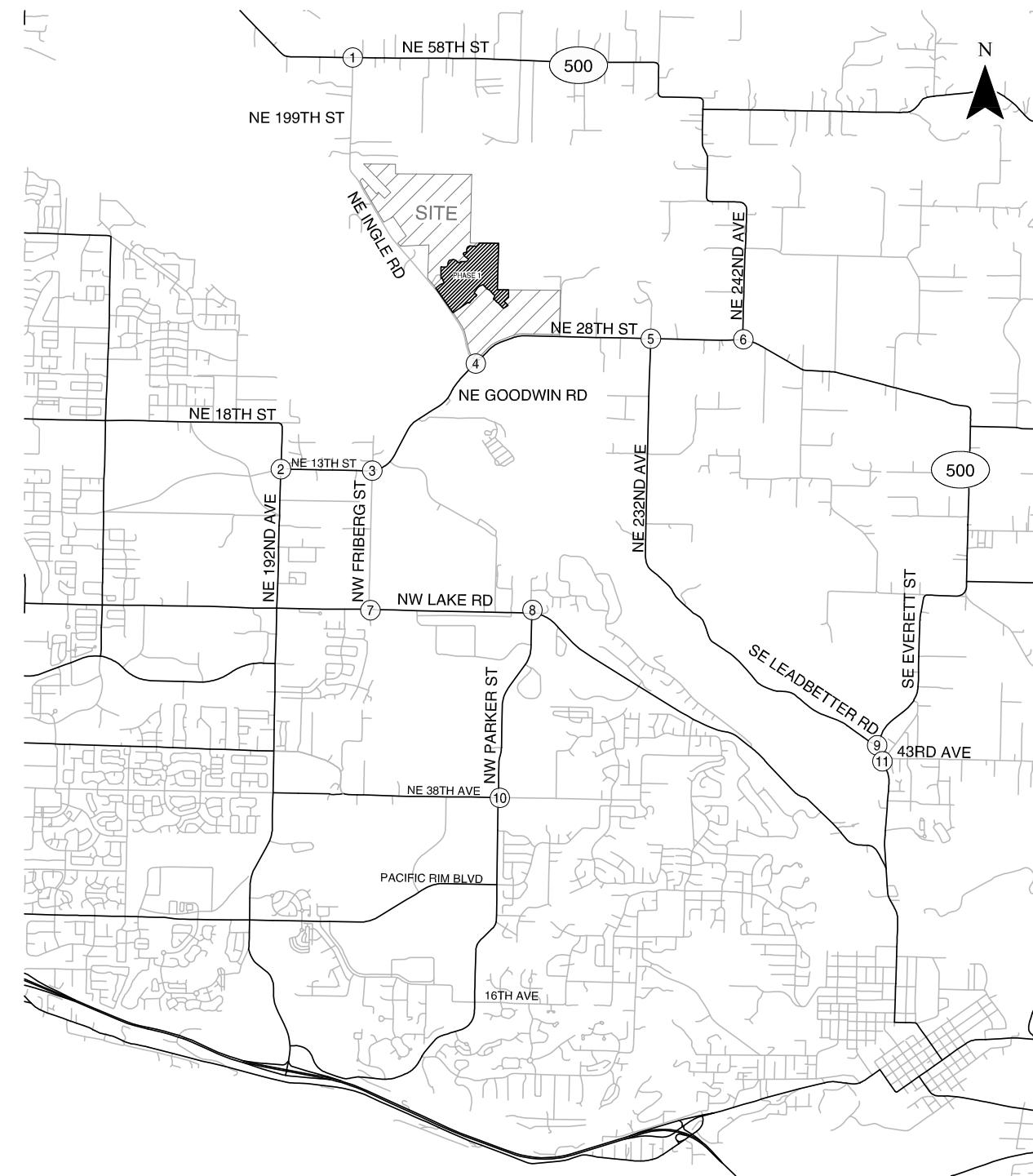
★ Volumes and operations based on 4 x peak 15 minutes and a peak hour factor of 1.0



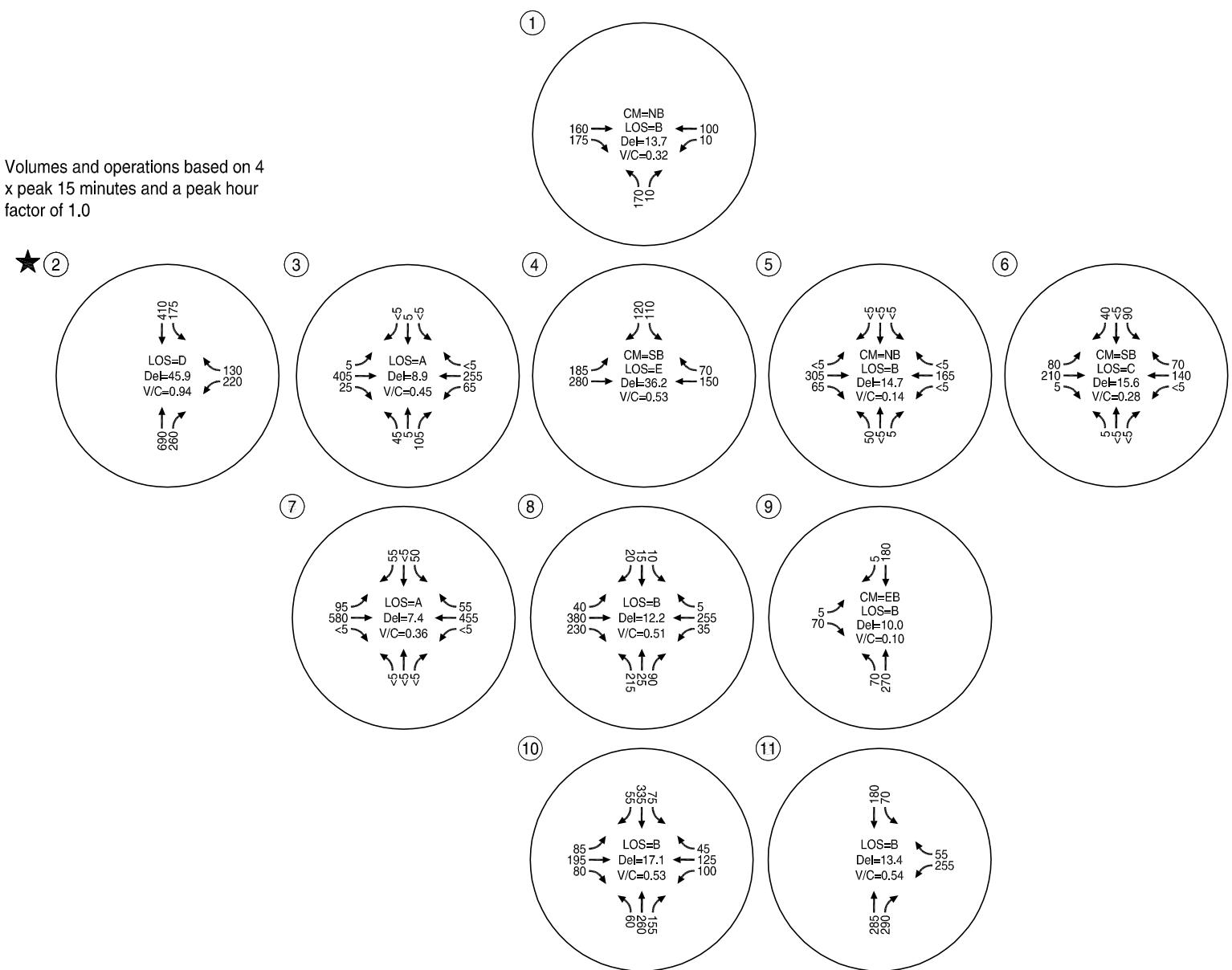
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 LEVEL OF SERVICE (TWSC)
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 MOVEMENT CONTROL DELAY (TWSC))
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
 TWSC = TWO-WAY STOP CONTROL

2018 Total Traffic Conditions (Phase 1)
Weekday AM Peak Hour
Camas, Washington

Figure
14



★ Volumes and operations based on 4 x peak 15 minutes and a peak hour factor of 1.0



CM = CRITICAL MOVEMENT (TWSC)
 LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT
 LEVEL OF SERVICE (TWSC)
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL
 MOVEMENT CONTROL DELAY (TWSC))
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
 TWSC = TWO-WAY STOP CONTROL

2018 Total Traffic Conditions (Phase 1)
Weekday PM Peak Hour
Camas, Washington

Figure
15

2029 Background Traffic Conditions

The 2029 background traffic analysis identifies how the study area's transportation system will operate with regional growth, including completion of Phase 1 development. No further funded transportation improvement projects were identified at the study intersections that would be in place prior to the year 2029. In addition to the previously described in-process development, a one percent annual growth rate was applied to the 2018 background traffic volumes on City of Camas roadways to account for regional growth in the area per staff direction. Continued use of a two percent annual growth rate was assumed to the City of Vancouver roadways (NE 192nd Avenue).

The same lane configurations used in the 2018 analysis were assumed, with the exception of the configuration at NE Ingle Road/NE Goodwin Road. As previously noted, the developer proposes to construct an exclusive eastbound left-turn lane at the intersection in conjunction with the Phase 1 site development so this turn lane was assumed for the 2029 analysis. Signal timings were optimized with the assumption that signals in the area will be re-timed in the next fifteen years. In addition, some peak hour factors (PHF) were increased to account for future traffic changes, including:

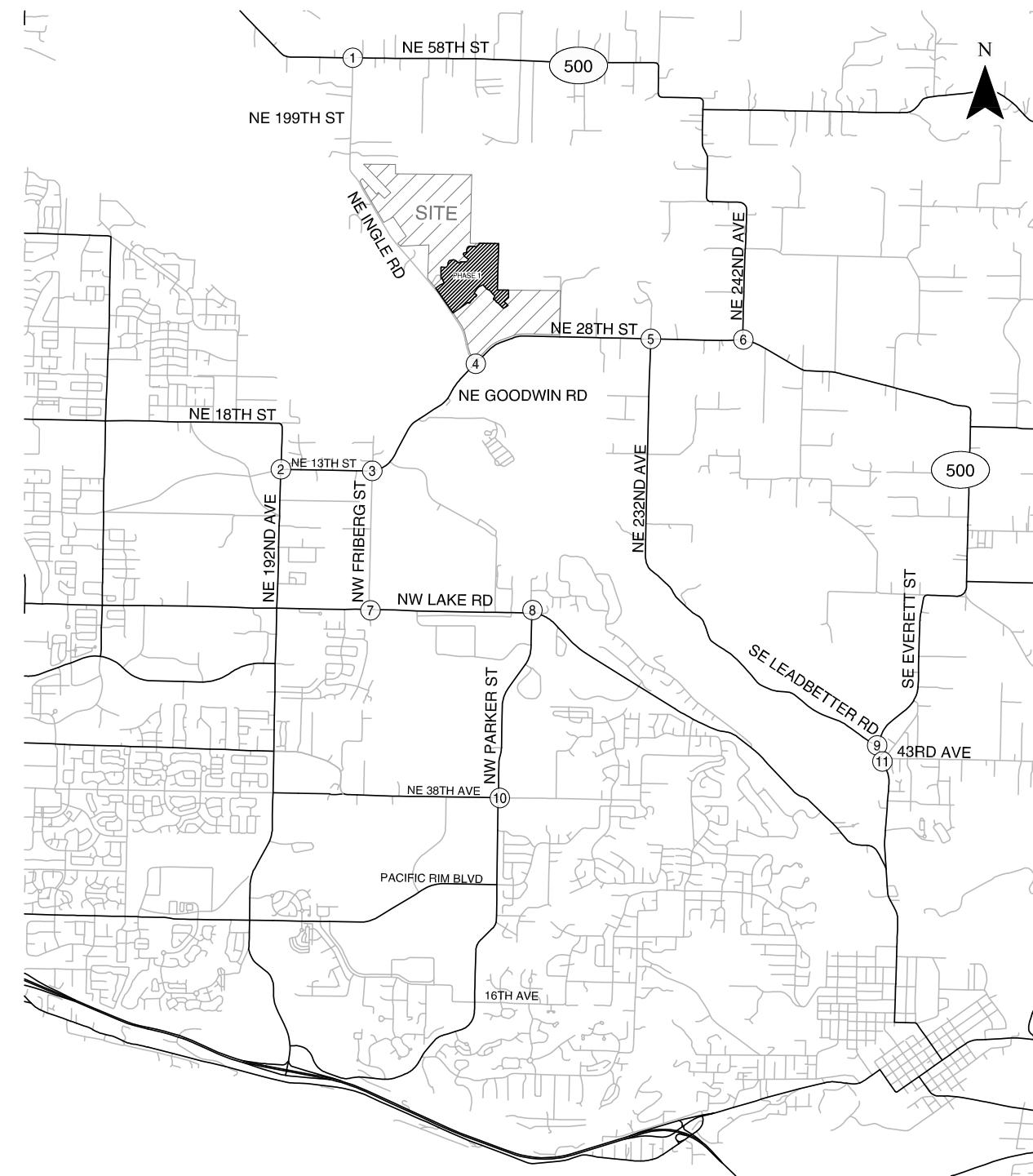
- PHF increased to 0.80 in the a.m. peak hour at NW Friberg Street/NE Goodwin Road and NE 242nd Avenue/NE 28th Street
- PHF increased to 0.75 in the a.m. peak hour at NW Friberg Street/NW Lake Road; NW Parker Street/NW Lake Road; and NW Parker Street/NE 38th Avenue

Traffic Operations

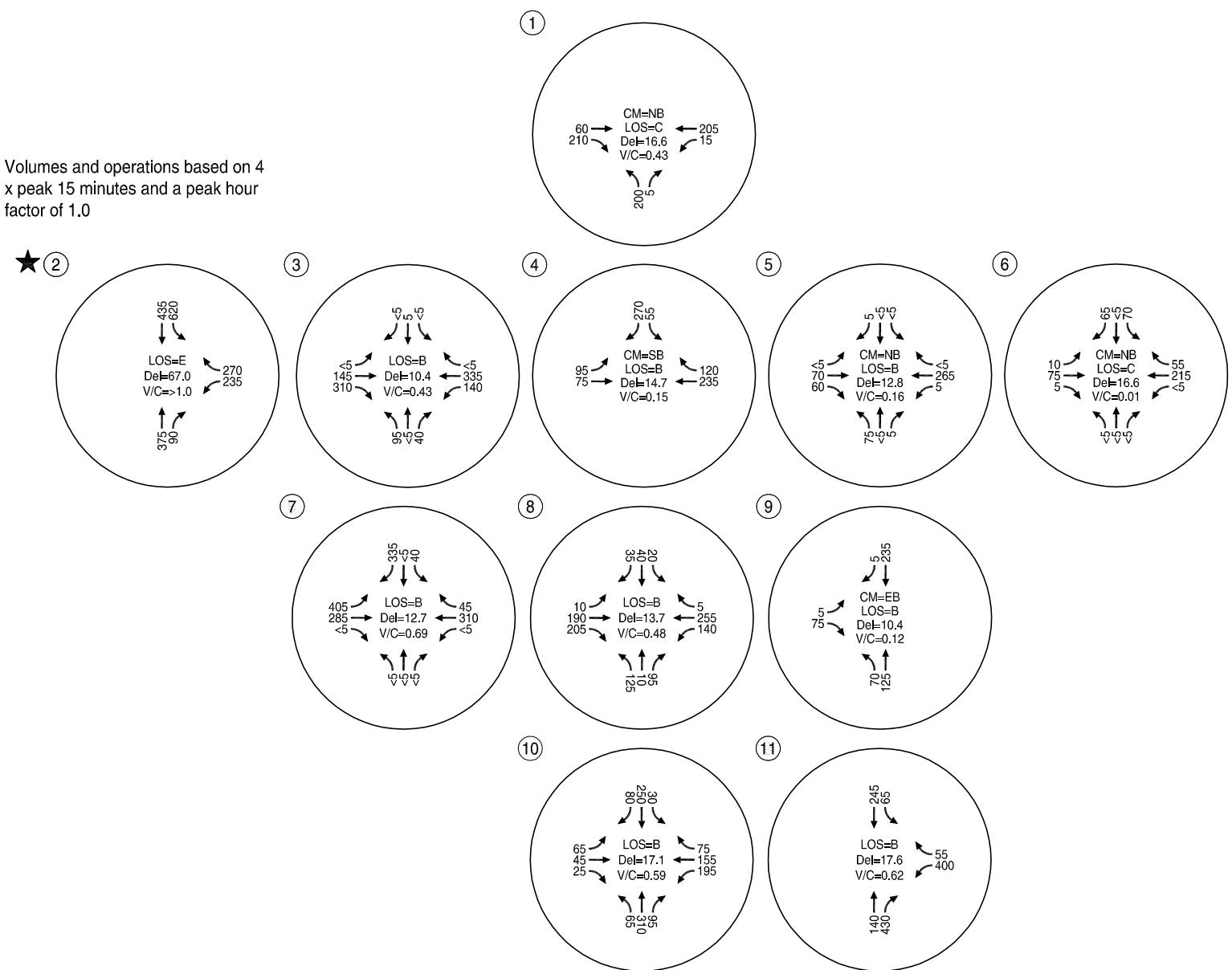
Figures 16 and 17 summarize the year 2029 background traffic operations analysis results at the study intersections for the weekday a.m. and weekday p.m. peak-hours, respectively. As illustrated in the figures, all but two of the study intersections are forecast to operate acceptably:

- The intersection of NE 192nd Avenue/NE 13th Street is projected to operate at a LOS E and over-capacity during the weekday a.m. peak hour and LOS F and over-capacity during the p.m. peak hour.
- The southbound approach to the intersection of NE Ingle Road/NE Goodwin Road is projected to operate at a LOS E during the weekday p.m. peak hour (with provision of the westbound right-turn lane recommended in conjunction with Phase 1 site development).

Appendix "J" contains the 2029 background conditions traffic operations worksheets.



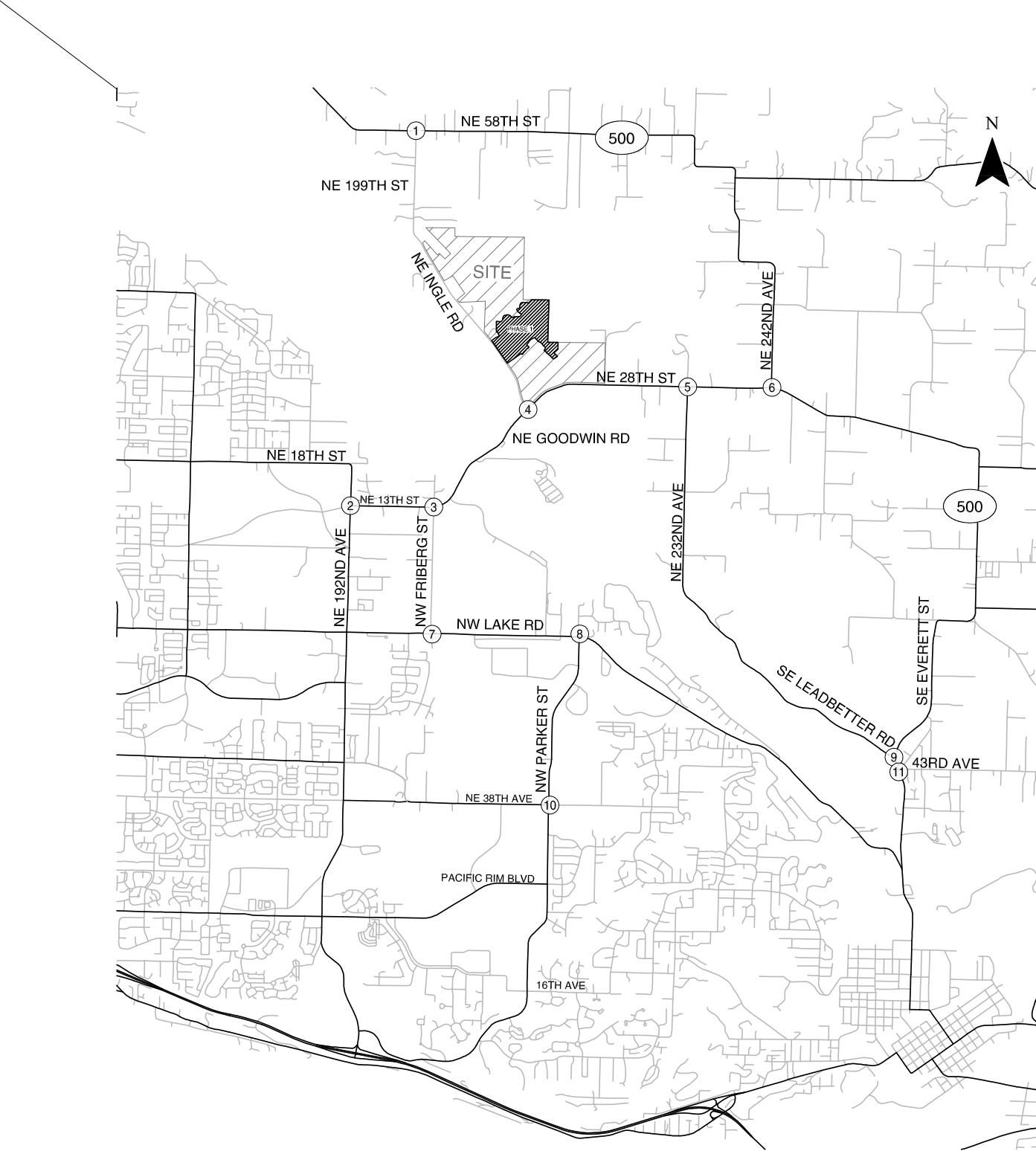
★ Volumes and operations based on 4 x peak 15 minutes and a peak hour factor of 1.0



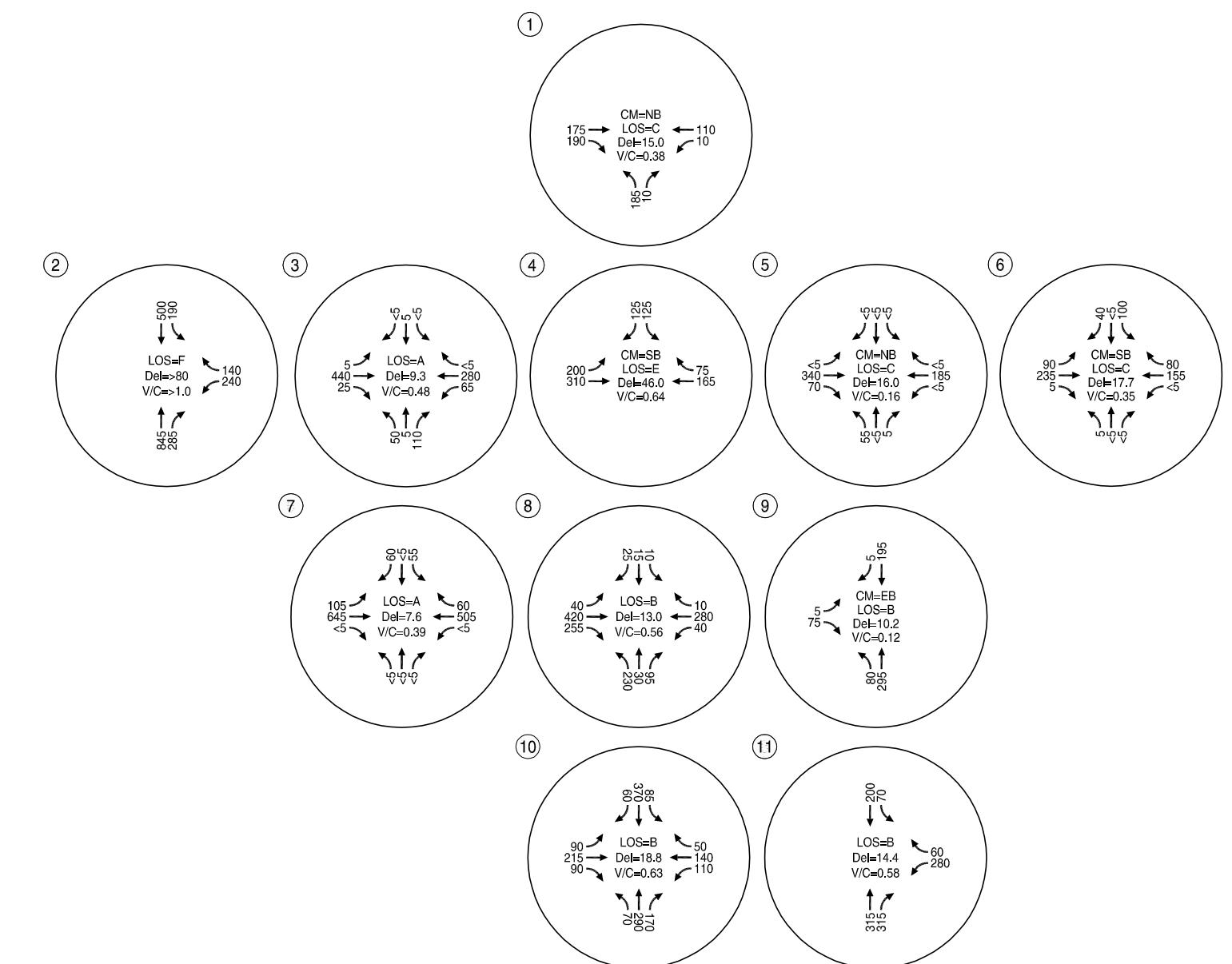
CM = CRITICAL MOVEMENT (TWSC)
 LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT
 LEVEL OF SERVICE (TWSC)
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL
 MOVEMENT CONTROL DELAY (TWSC))
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
 TWSC = TWO-WAY STOP CONTROL

2029 Background Conditions
Weekday AM Peak Hour
Camas, Washington

Figure
16



CM = CRITICAL MOVEMENT (TWSC)
 LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT
 LEVEL OF SERVICE (TWSC)
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL
 MOVEMENT CONTROL DELAY (TWSC))
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
 TWSC = TWO-WAY STOP CONTROL



2029 Background Conditions
Weekday PM Peak Hour
Camas, Washington

Figure
17

2029 Total Traffic Conditions

The year 2029 total traffic analysis forecasts how the study area's transportation system will operate with full build-out of the proposed master plan development. The year 2029 background traffic volumes were added to the full build-out site-generated traffic to arrive at the total traffic volumes.

Traffic Operations

Figures 18 and 19 summarize the year 2029 total traffic operations analysis results at the study intersections for the weekday a.m. and weekday p.m. peak-hours, respectively. The projected turning movement counts are rounded to the nearest five vehicles per hour. As shown, the following study intersections do not meet standards during either the weekday a.m. or p.m. peak periods:

- NE 199th Avenue/NE 58th Street (SR 500) (weekday a.m. and p.m. peak hours)
- NE 192nd Avenue/NE 13th Street (weekday a.m. and p.m. peak hours, previously was failing during background a.m. and p.m. peak hours)
- NE Ingle Road/NE Goodwin Road (weekday a.m. and p.m. peak hours, previously was failing during background p.m. peak hour)

Potential mitigation measures for these intersections are discussed later in the report.

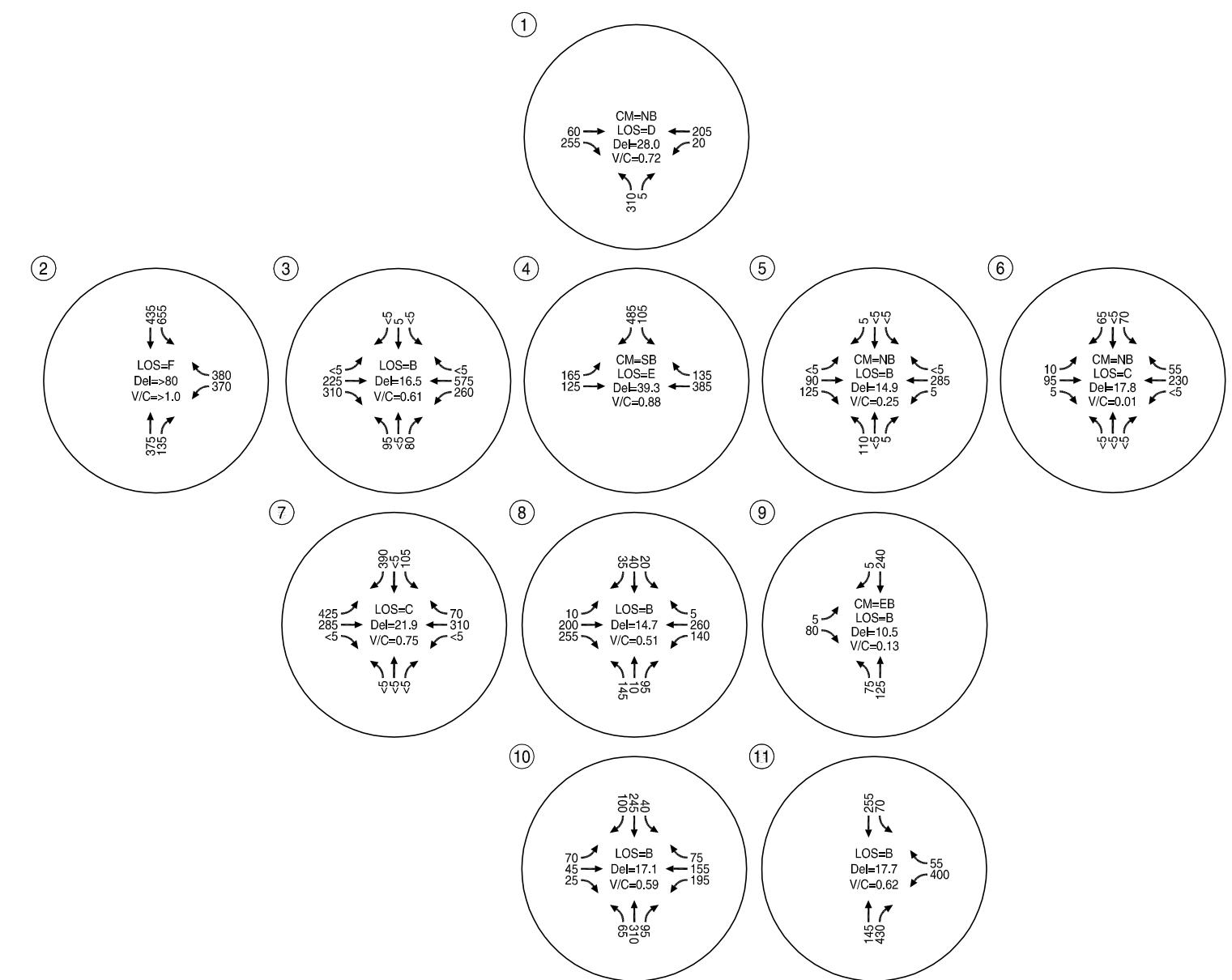
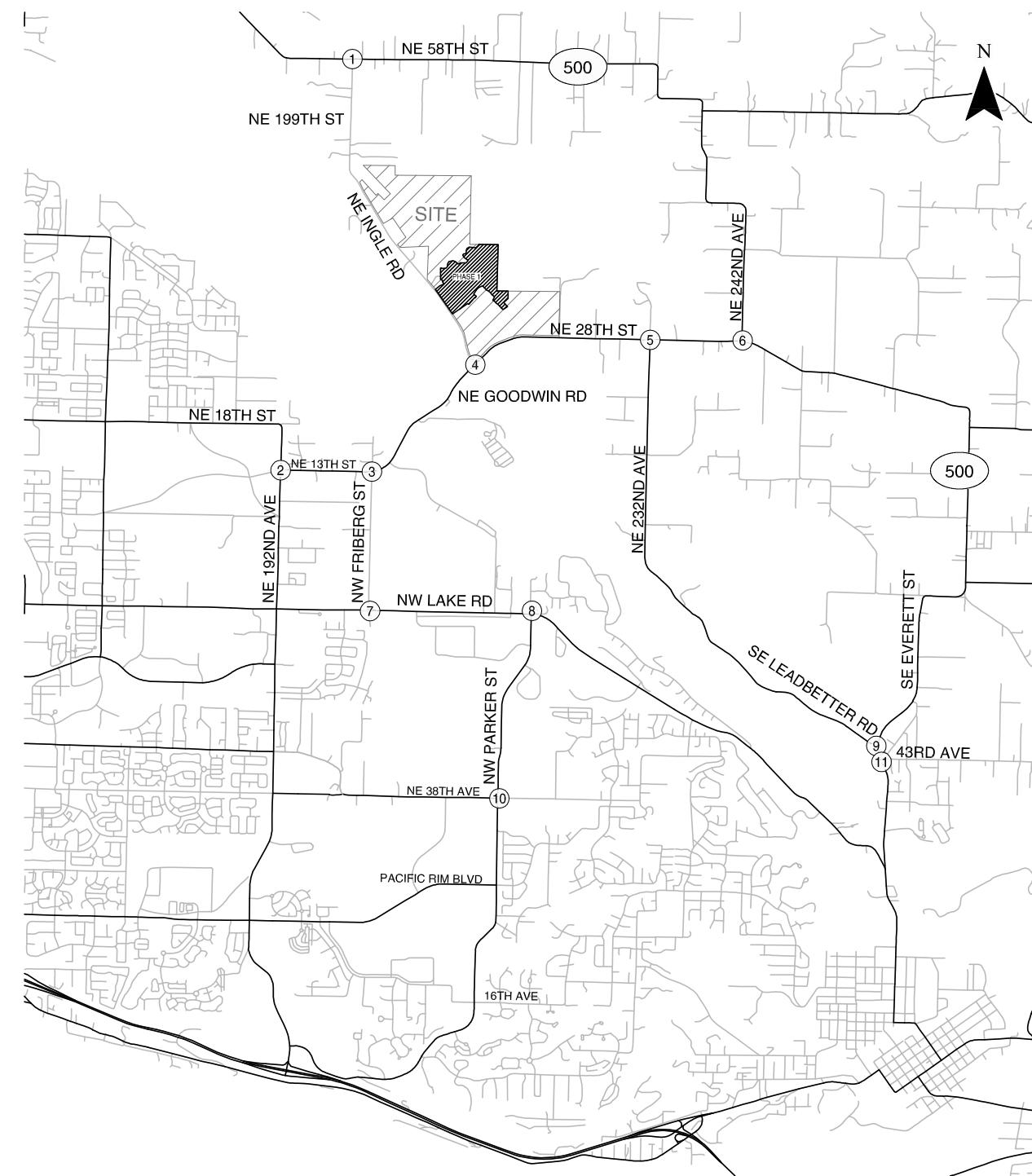
Appendix "K" contains the 2029 total traffic conditions traffic operations worksheets.

Turn-Lane Considerations

As referenced under the "Analysis Methodology," roadways under Washington State jurisdiction are subject to the turn lane guidelines contained in the *WSDOT Design Manual* (Reference 3). The potential need for turn-lanes at each study intersection was reviewed for the analysis scenarios. Intersections that meet turn-lane guidelines are further discussed below.

NE 199th Avenue/NE 58th Street (SR 500)

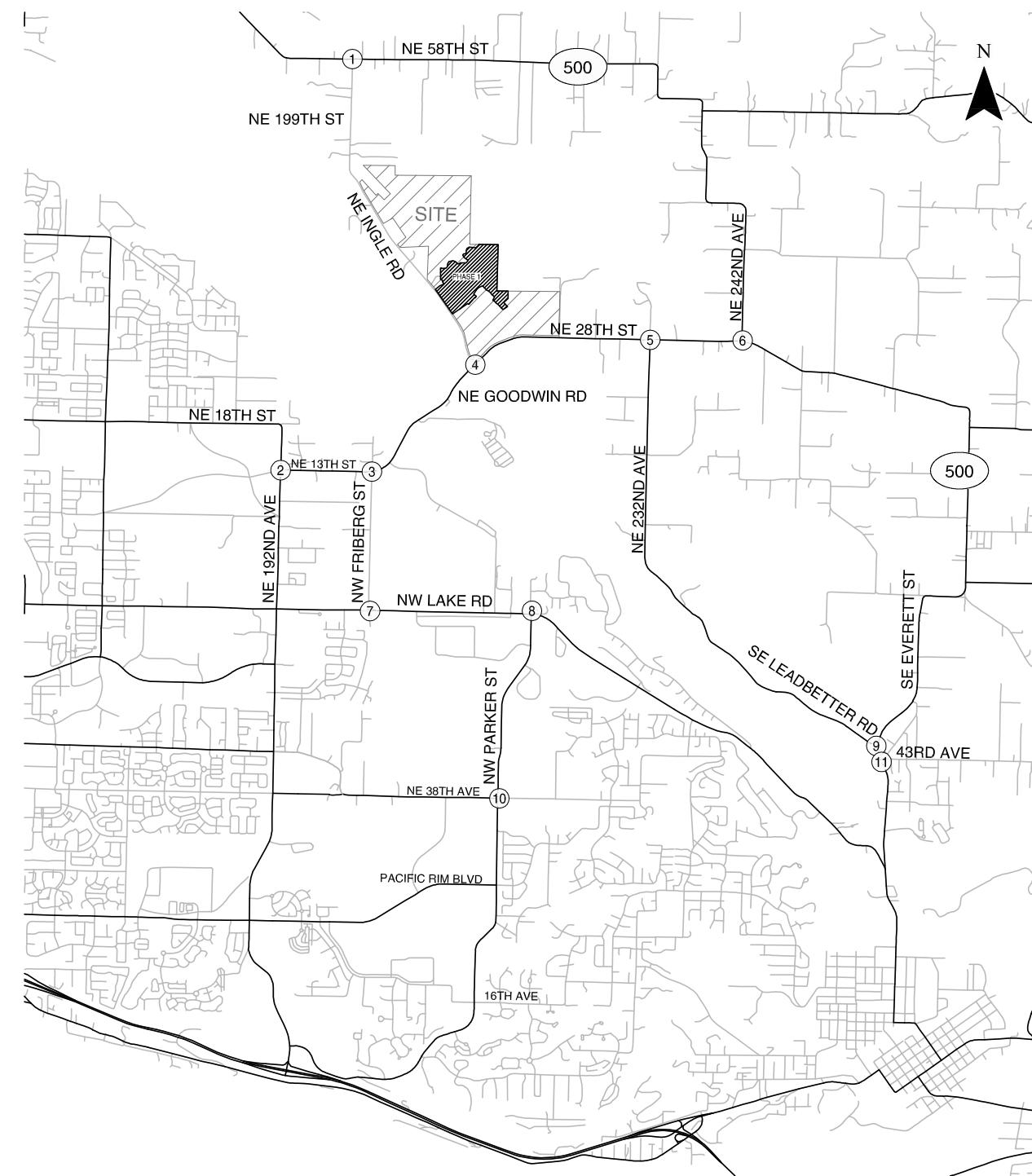
Traffic volumes at the intersection of NE 199th Avenue/NE 58th Street (SR 500) meet WSDOT's guidelines for an eastbound right-turn lane on NE 58th Street under existing conditions and all future scenarios during both the weekday a.m. and p.m. peak hour. Construction of a right-turn lane could require right-of-way acquisition and will likely impact one or more private driveways along NE 58th Street (depending on the length of the deceleration lane constructed).



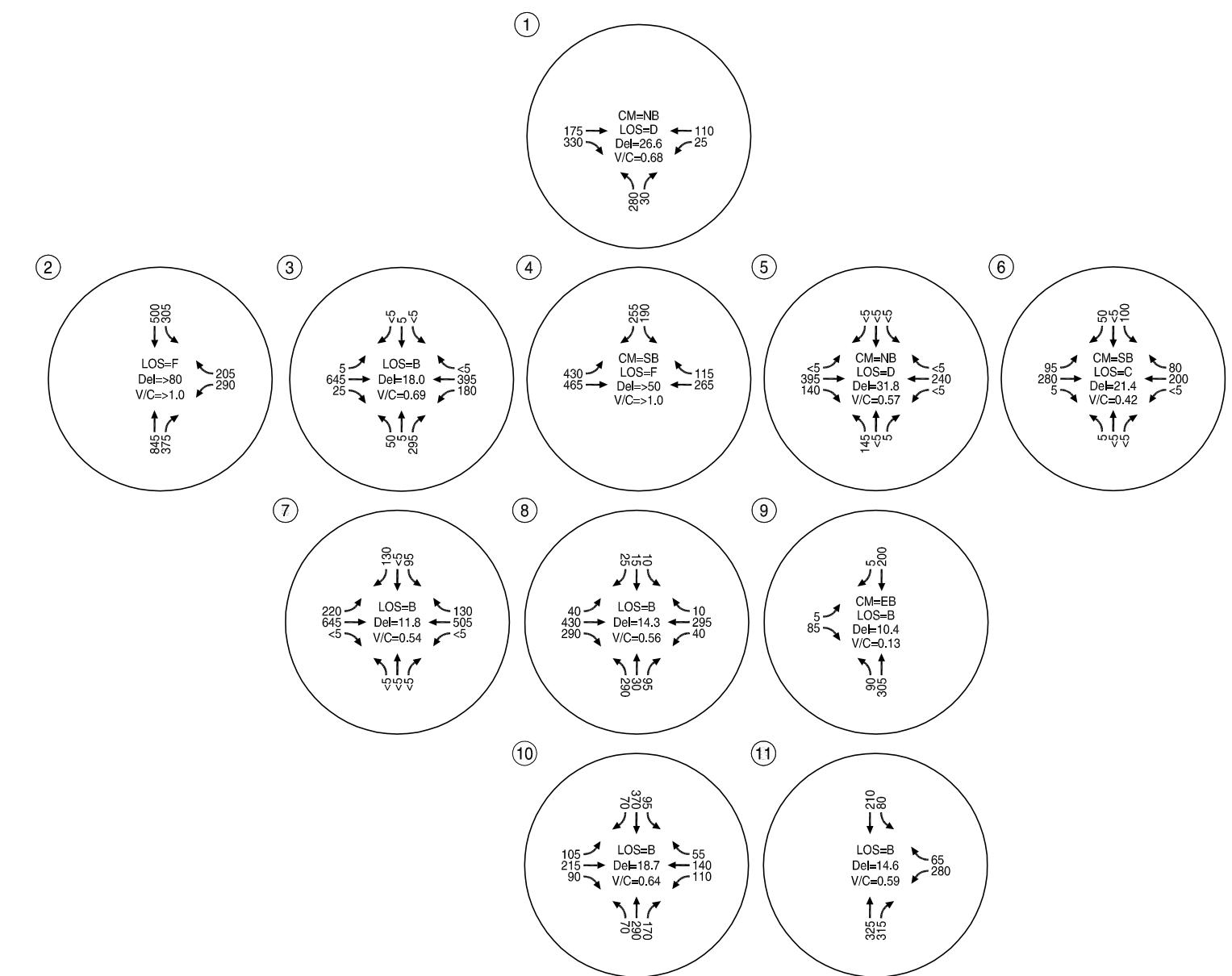
CM = CRITICAL MOVEMENT (TWSC)
 LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT
 LEVEL OF SERVICE (TWSC)
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL
 MOVEMENT CONTROL DELAY (TWSC))
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
 TWSC = TWO-WAY STOP CONTROL

2029 Total Traffic Conditions (Build Out)
Weekday AM Peak Hour
Camas, Washington

Figure
18



CM = CRITICAL MOVEMENT (TWSC)
 LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT
 LEVEL OF SERVICE (TWSC)
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL
 MOVEMENT CONTROL DELAY (TWSC))
 V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
 TWSC = TWO-WAY STOP CONTROL



2029 Total Traffic Conditions (Build Out)
Weekday PM Peak Hour
Camas, Washington

Figure
19

The table below assesses volumes at the intersection for various horizon year scenarios and the impact of the proposed development.

Table 7: NE 199th Avenue/NE 58th Street (SR 500) Eastbound Right-Turn Lane Assessment

Scenario	Eastbound Right-Turn (EBRT) Volume	Meets Guideline?	Development-Added EBRT Trips	Impact of Development
2014 Existing Traffic – AM Peak	180	Yes	-	-
2014 Existing Traffic – PM Peak	145	Yes	-	-
2018 Background Traffic – AM Peak	180	Yes	8 (Phase 1)	4%
2018 Background Traffic – PM Peak	150	Yes	27 (Phase 1)	18%
2029 Background Traffic – AM Peak	210	Yes	45 (Build-out)	21%
2029 Background Traffic – PM Peak	190	Yes	138 (Build-out)	73%

The recorded crash history at the intersection was reviewed to identify potential safety issues that an eastbound right-turn lane might address. No crashes were reported involving vehicles making an eastbound right-turn. Given the lack of crash history and the relatively small impact of Phase 1, no improvements are recommended in conjunction with Phase 1. Nonetheless, given the amount of site-generated traffic that will be added to the eastbound right-turn movement as future phases of the master plan build-out, if right turn crashes materially increased, it is possible that a nexus could be established between requiring construction of an eastbound right-turn lane and traffic volume increases attributable to master plan trip development. Accordingly, we recommend that future site plan applications prepared subsequent to Phase 1 provide an updated assessment as to the potential need for providing a right-turn taper or lane at the intersection.

NE 242nd Avenue (SR 500)/NE 28th Street

Traffic volumes at the intersection of NE 242nd Avenue (SR 500)/NE 28th Street meet WSDOT's guidelines for a left-turn lane on the eastbound approach under existing conditions and all future scenarios during the weekday p.m. peak hour. The table below assesses volumes at the intersection for each horizon year scenario and the impact of the proposed development. *As shown in the table, the Phase 1 development does not add any trips to the eastbound left-turn lane.* The trips generated by build-out of the master plan development are from the retail component and total less than 10.

Table 8: NE 242nd Avenue (SR 500)/NE 28th Street Eastbound Left-Turn Lane Assessment

Scenario	Eastbound Left-Turn Volume	Meets Guidelines? (Recommended Storage)	Development-Added Trips	Impact of Development
2014 Existing Traffic – AM Peak	10	No	-	-
2014 Existing Traffic – PM Peak	80	Yes (100 feet)	-	-
2018 Background Traffic – AM Peak	10	No	0 (Phase 1)	0%
2018 Background Traffic – PM Peak	80	Yes (100 feet)	0 (Phase 1)	0%
2029 Background Traffic – AM Peak	10	No	2 (Build-out)	20%
2029 Background Traffic – PM Peak	90	Yes (100 feet)	9 (Build-out)	10%

The recorded crash history at the intersection was reviewed to identify potential safety issues that an eastbound left-turn lane might address. While two angle crashes were reported from vehicles making a southbound left-turn, no crashes were reported involving vehicles making an eastbound left-turn.

Based on our review of the information provided above, we find no basis for recommending improvements to the NE 242nd Avenue (SR 500)/NE 28th Street intersection in conjunction with Phase 1 site development. We base this conclusion on the proposed development adding no trips to the left-turn movement in question, the lack of crash history related to left-turns, and the general lack of a nexus given the small trip impact of the proposed Phase 1 development at this location.

Planned Future Intersection Improvements

The *2012 City of Camas Traffic Impact Fee Update Report* (Reference 2) identifies the future need to widen NE 28th Street to have a center left-turn lane from Ingle Road to NE 242nd Avenue. A related project would create a new NE 242nd Avenue extension south of NE 28th Street. Given the City's planned improvements, we recommend the City of Camas make a finding that the traffic impact fee payments made by the master plan for Phase 1 and future phases of the project mitigate development impacts at the intersection, and therefore require no additional mitigation.

Recommended Mitigations

As discussed above, all study intersections meet operating standards under existing and 2018 background and total traffic conditions for both the weekday a.m. and p.m. peak hours. Four intersections do not meet operating standards in 2029 under background and/or total traffic conditions; each is discussed below.

NE 199th Avenue/NE 58th Street (SR 500)

The minor street northbound left-turn at the intersection of NE 199th Avenue/NE 58th Street (SR 500) is projected to not meet current WSDOT standards in the 2029 total traffic conditions during the weekday a.m. and p.m. peak hours. The intersection is projected to operate at a volume-to-capacity (v/c) ratio of 0.72 and LOS D during the a.m. peak hour and v/c ratio of 0.70 and LOS D during the p.m. peak hour. It is therefore not within WSDOT's LOS requirement (LOS C) for non-HSS facilities in rural areas. The intersection is three-legged and stop-controlled on the northbound approach. The northbound left-turn is the critical movement at the intersection, with all other movements operating at a LOS A and well under capacity. During both the weekday a.m. and p.m. peak hours, the northbound left-turn is 3 seconds or less over the delay threshold between LOS C and LOS D. In the event that the area around the intersection urbanizes before build-out, the WSDOT performance standard will shift to LOS E and the intersection would operate within WSDOT standards.

As discussed in the *Turn-Lane Considerations* section above, the intersection currently meets warrants for an eastbound right-turn lane, which would improve operations for northbound left-turning vehicles to a LOS C during the 2029 total traffic conditions. As also discussed above, it is expected that a nexus might ultimately be established between requiring construction of an eastbound right-turn lane and traffic volume increases attributable to master plan trip development, based on LOS and delay at the intersection. Accordingly, we recommend that future site plan applications prepared subsequent to Phase 1 provide an updated assessment as to the potential need for providing a right-turn taper or lane at the intersection, considering both the need for a right-turn taper or lane and delay with the northbound left-turn.

Appendix "L" contains the traffic operations worksheets supporting the potential mitigations at NE 199th Avenue/NE 58th Street (SR 500).

NE 192nd Avenue/NE 13th Street

The intersection of NE 192nd Avenue/NE 13th Street is projected to not meet standards in the 2029 background conditions and the 2029 total traffic conditions during both the weekday a.m. and p.m. peak hours. The intersection operates over-capacity in all four of these scenarios and at a LOS F during the weekday p.m. peak hour in the background conditions and weekday a.m. and p.m. peak hours in the total traffic scenarios.

Potential Future City of Vancouver Improvements

The City of Vancouver has identified NE 192nd Avenue as ultimately requiring five travel lanes (two southbound through lanes, a center left-turn lane, and two northbound through lanes) and includes

the widening on the City's Traffic Impact Fee (TIF) program project list. Because no near-term funding has been programmed for the future five-lane section, the existing section was assumed to be in place in 2029 for the purposes of this traffic study. Widening by the City of Vancouver or others in the interim would add capacity and change the intersection operations.

In the event that NE 192nd Avenue is widened to five lanes through the NE 13th Street intersection, the intersection is projected to meet City of Vancouver intersection operating standards under 2029 background conditions. To mitigate total traffic conditions, a westbound right-turn lane would also be required. In the event that 192nd Avenue is not widened, a northbound right-turn lane and westbound right-turn lane would be sufficient to mitigate 2029 total traffic conditions (mitigation assumes maintaining operations equivalent to or better than those experienced under 2029 background conditions with site build-out but does not fully accommodate forecast queuing).

Potential Master Plan Development Mitigation Options

As noted above, the provision of a northbound right-turn lane and westbound right-turn lane would offer more than sufficient capacity to mitigate the impact of the master plan site build-out while also providing additional capacity to allow for future growth and development. Therefore, we recommend the Green Mountain Master Plan provide a proportionate share contribution towards the construction of a northbound right-turn lane and a westbound right-turn lane on NE 13th Avenue. The City of Vancouver has successfully administered pro-rata share contribution collection systems at other intersections, allowing each development impacting a failing intersection to contribute a "fair-share" of the mitigation cost.

Appendix "M" identifies a proposed proportionate cost sharing methodology. Under this methodology, each trip would be assessed a fee of \$391. Therefore the Green Mountain development contribution at full build-out would be approximately \$123,600. Details of the cost estimate, capacity generated by the improvements, and impact of the proposed development supporting the proportionate share calculations are provided in Appendix "M."

It should be noted that the NE 192nd Avenue/NE 13th Street intersection is listed on the City of Vancouver's TIF program project list. In the case of the Green Mountain Master plan, any TIF credits issued by the City of Vancouver would only be redeemable for development impacts in Vancouver (not Camas).

NE Ingle Road/NE Goodwin Road

The intersection of NE Ingle Road/NE Goodwin Road is projected to not meet City of Camas intersection operating standards in the 2029 background conditions during the weekday p.m. peak

hour and the 2029 total traffic conditions during both the weekday a.m. and p.m. peak hours. In order to mitigate 2029 background conditions, a two-way left-turn lane could potentially be provided east of the intersection to facilitate southbound left-turns, which are the critical movement at the intersection.

The City's long-term plans anticipate significant reconstruction of the intersection and the approaching roadways as recorded in the 2012 *City of Camas Traffic Impact Fee Update* (Reference 2). Identified improvement needs include:

- Installation of a traffic signal at NE Ingle Road/NE Goodwin Road;
- The extension of a new collector roadway from NE Ingle Road south to NE 232nd Avenue;
- Widening of NE Goodwin Road from two to three lanes between NE Ingle Road and NE 232nd Avenue; and
- Widening of NE Goodwin Road from two to five lanes NE between Friberg Street and NE Ingle Road.

Considering the Green Mountain Master Plan project location and traffic impacts at the intersection, we recommend the following series of mitigations in conjunction with the proposed development:

- Construct an eastbound left-turn lane on NE Goodwin Road at NE Ingle Road with the first Phase 1 trip.
- Construct a westbound right-turn lane on NE Goodwin Road at NE Ingle Road with the 203rd Phase 1 trip (prior to occupancy of 203rd single family home on site). The right-turn lane should provide at least 100 feet of storage. (Note, in the long-term future, the City could consider restriping the right-turn lane to a shared through/right lane when widening of NE Goodwin Road west of NE Ingle Road develops two westbound receiving lanes).
- Construct a three-lane roadway section (with center two-way left-turn lane) on NE Goodwin Road along the site frontage in conjunction with standard frontage improvements as adjacent development occurs.
- Upon completion of Phase 1 site development (including construction of the eastbound left-turn lane and westbound right-turn lane on NE Goodwin Road at NE Ingle Road with Phase 1), the developer shall monitor the need for installation of a traffic signal with each future site plan application at the intersection and construct a traffic signal when the intersection no longer satisfies City of Camas performance standard (LOS "D" and v/c of 0.90 or better) *and* the intersection volumes meet traffic signal warrants (subject to direction from the City of Camas).

- The monitoring effort is recommended to require preparation of then-current traffic counts, assessment of traffic signal warrants based on build-out of the then-current site plan application (and all other approved development), and a summary report prepared by a licensed professional engineer. The study should consider potential turn movement re-routing that is expected to occur at the NE Goodwin Road/NE Ingle Road intersection as new connections to the master plan site are made to NE Goodwin Road east of NE Ingle Road.

On-site Circulation and Operations

We recommend that a detailed review of on-site circulation and operations be prepared in conjunction with each future site plan application. This review will provide an opportunity to consider site-specific details when they become available and should include consideration of vehicular, pedestrian, and delivery vehicle paths.

On-site landscaping, signage and any above-ground utilities should be provided appropriately to ensure that adequate sight distance is provided and maintained and should be considered as part of future site plan applications.

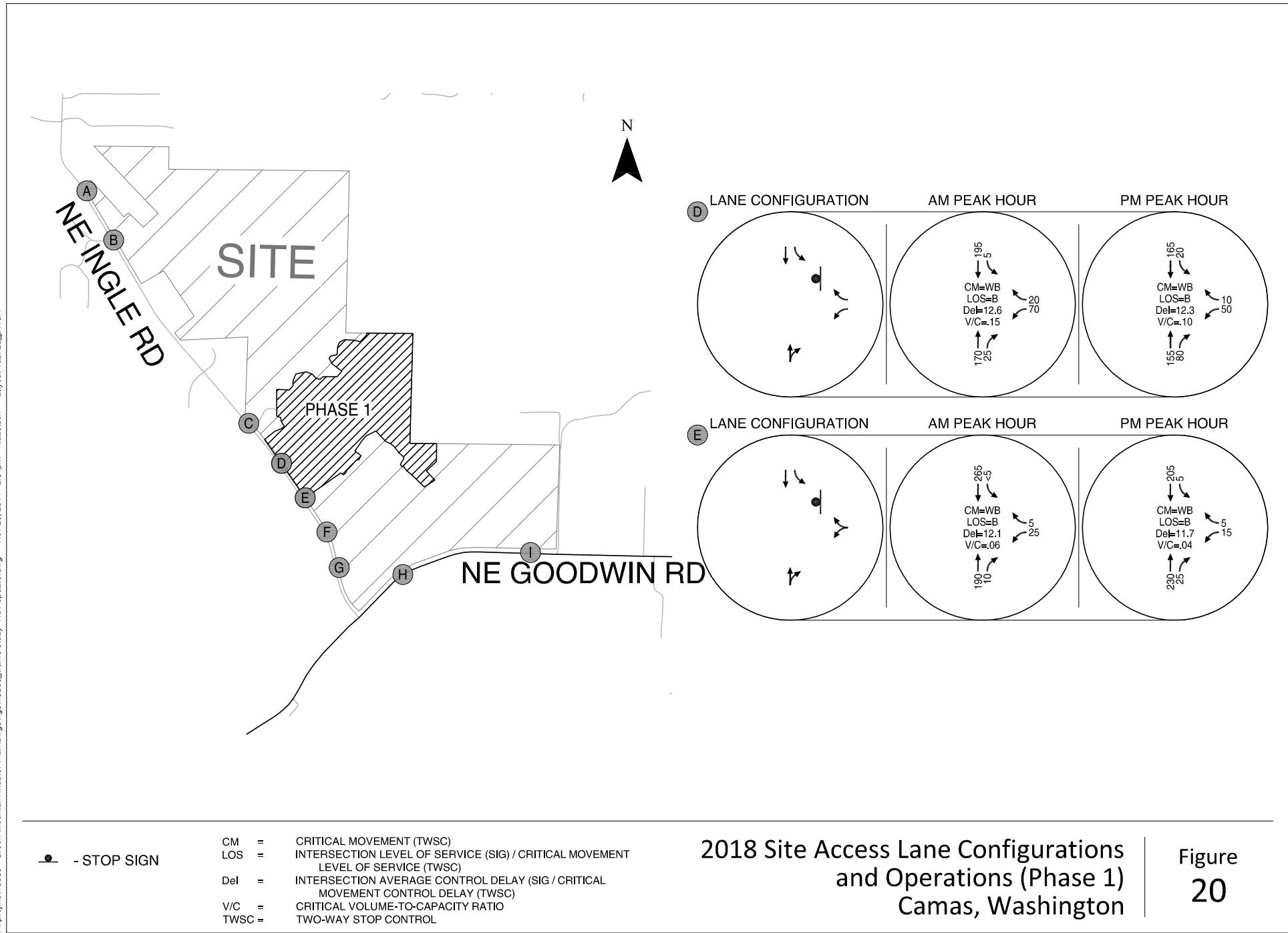
Access Requirements

The City of Camas requires a minimum intersection spacing of 330 feet on three lane collector streets. This spacing should be maintained with the proposed development.

Phase 1 Access Operations

The portion of the site that will be developed with Phase 1 is noted in Figure 2. As seen, two access points are proposed for the Phase 1 development. The proposed lane configuration at these accesses and operations is shown in Figure 20. The developer has proposed to maintain access to the existing golf course in conjunction with the Phase 1 development. The existing gravel maintenance only access will be improved to provide an interim main access to the remaining portion of the golf course (reduced to eight holes). The proposed interim golf course access is located approximately 400 feet south of the proposed southern access, which meets the City's intersection spacing requirements for a collector street noted above.

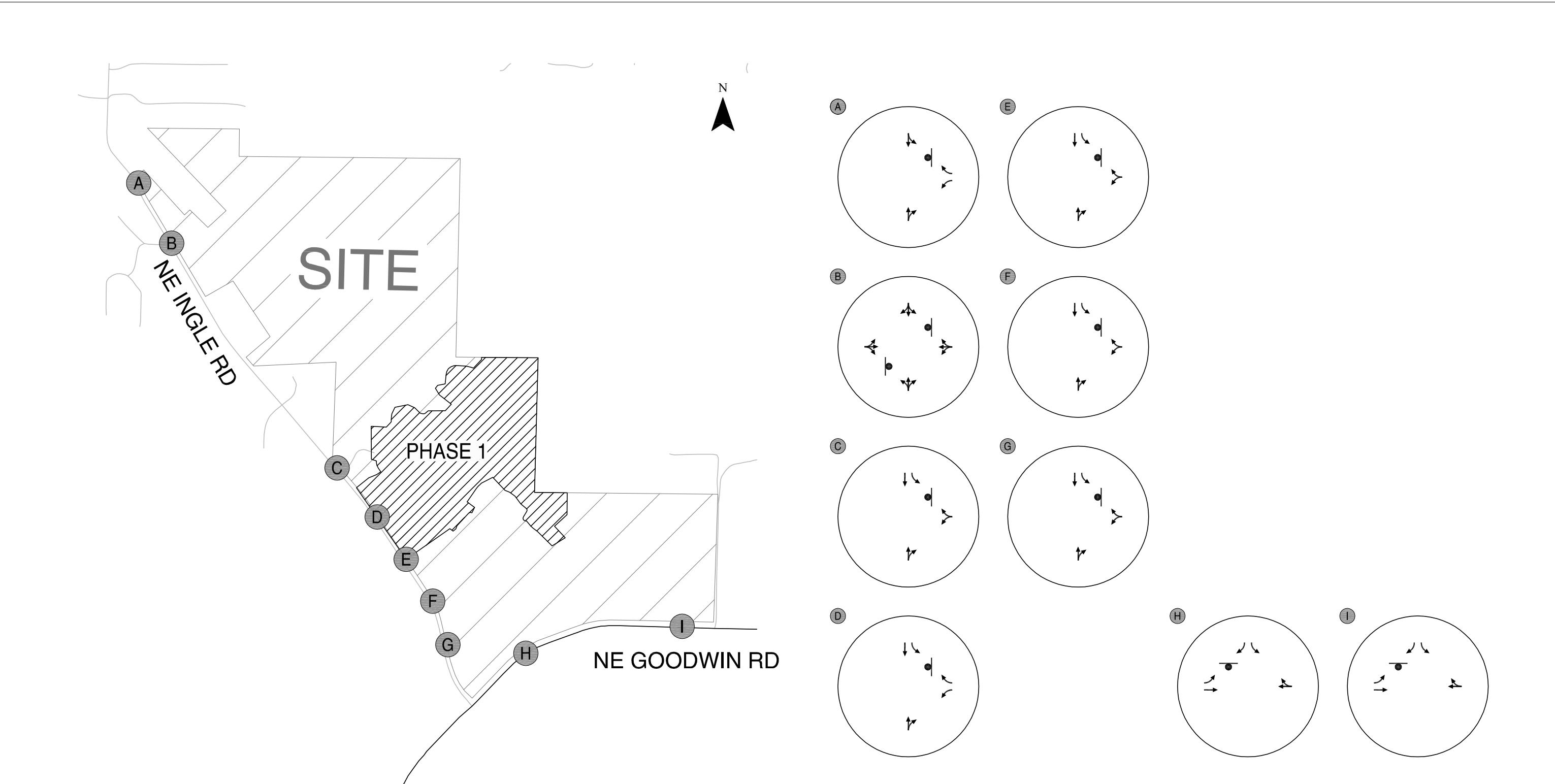
Appendix "N" contains the traffic operations worksheets for the Phase 1 access operations.



Build-out Access Operations

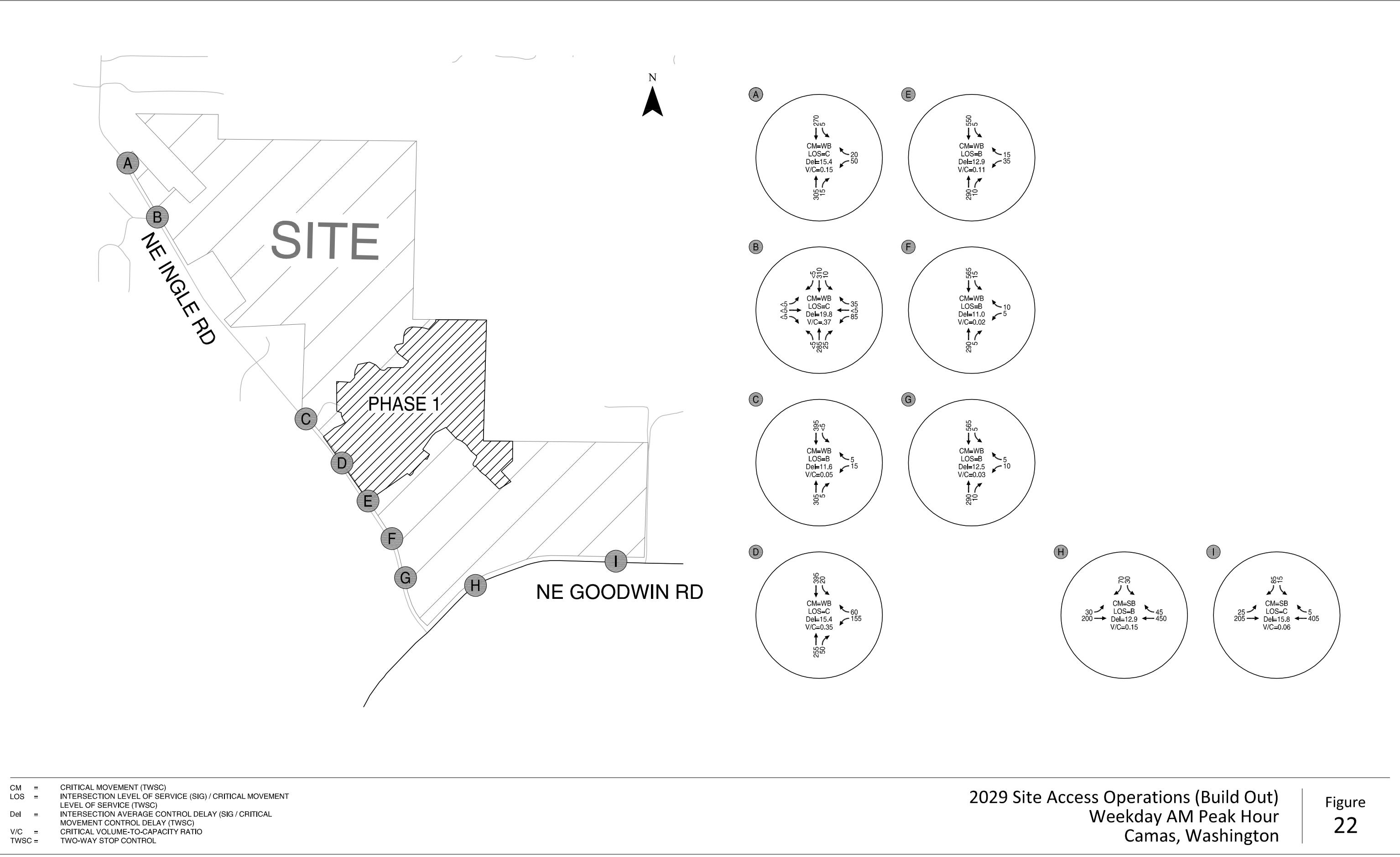
An additional five access points on NE Ingle Road and two access points on NE Goodwin Road are anticipated with full build-out of the development. The exact location of the access points may change as the plans for the development are refined. We assessed operations at these access points assuming the lane configuration shown in Figure 21. As seen in the figure, we expect NE Ingle Road will be developed with a center two-way left-turn lane (TWLTL) through access "C" and NE Goodwin Road will be developed with a TWLTL along the site frontage. Operations at the site accesses for the weekday a.m. and p.m. peak hours are shown in Figures 22 and 23. As seen in the figures, all access points operate at a LOS "C" or better, with the exception of the eastern access on NE Goodwin Road. The southbound left-turn movement at this intersection operates at a LOS D during the weekday p.m. peak hour.

We recommend further evaluation of potential right-turn deceleration lane needs be considered at the time of site plan application. This evaluation should consider the potential need for southbound left-turn lanes or northbound right-turn lanes along NE Ingle Road at the remaining access points as well as corresponding turn lane queue storage requirements. *Appendix "O" contains the traffic operations worksheets for the full build-out access operations.*



Site Access Lane Configurations and Traffic Control Devices (Buildout)
Camas, Washington

Figure
21





2029 Site Access Operations (Build Out)
Weekday PM Peak Hour
Camas, Washington

Figure
23

TRANSPORTATION COMPLIANCE LETTER

This master plan traffic study documents the transportation implications of the proposed development at build-out. There are on-site access, circulation, turn lane, and driveway location and design considerations that will need to be addressed when specific site plan applications are made. Further, the phasing and timing of master plan build-out is likely to evolve over time to adapt to market conditions. Accordingly, it is recommended that a transportation compliance letter be prepared for each preliminary plat or site plan application to address on-site transportation, access and pedestrian standards and to ensure that the mitigation measures provided for in this report are applied at the appropriate phase of development. The transportation compliance letter should also document the trip generation of each phase of development to ensure that the total number of trips generated from future development does not exceed the number of trips vested under the Development Agreement.

We recommend each transportation compliance letter could document:

- The number of site-generated trips (daily, weekday a.m. peak hour, weekday p.m. peak hour) estimated to be used by the then-current proposed site development application.
- The number of site-generated trips (daily, weekday a.m. peak hour, weekday p.m. peak hour) previously used by approved site development applications on the master plan site.
- An accounting of the number of site-generated trips (daily, weekday a.m. peak hour, weekday p.m. peak hour) remaining assuming approval of the then-current site plan application.
 - Note: In the event that a future site plan application is projected to use more trips than were previously assumed through the master plan, additional traffic capacity/concurrency analysis would be triggered (unless a traffic count cordon-study of the master plan campus demonstrates the number of trips generated by the site is less than projected by standard ITE trip rates and thus the overall development impact actually is less than or equal to the number of trips assumed by the master plan).
- Evaluation of outstanding mitigation needs (as appropriate consistent with the Master Plan recommendations) at the intersections of:
 - Need for an eastbound right-turn lane at NE 199th Avenue/NE 58th Street (SR 500)
 - NE Ingle Road/NE Goodwin Road (including traffic signal warrant analysis)

FINDINGS AND RECOMMENDATIONS

Based on the results of the transportation impact analysis, Phase 1 of the Green Mountain Master Plan (estimated to generate 2,050 daily trips and 215 net new p.m. peak hour trips) can be developed while maintaining acceptable levels of service and safety at the study intersections without any required off-site mitigations. The primary findings and recommendations of this study are summarized below.

Existing Conditions

- All of the study intersections currently operate acceptably during the weekday a.m. and p.m. peak hours.

Proposed Development Activities

- Phase 1 site development includes 215 residential units. It is estimated to generate 160 net new a.m. peak hour trips (40 in and 120 out) and 215 net new p.m. peak hour trips (135 in and 80 out).
- Build-out of the site development includes 1,300 residential units and 90,000 square feet of retail use. Build-out (including Phase 1) is collectively estimated to generate a total of 995 net new a.m. peak hour trips (290 in and 705 out) and 1,655 net new p.m. peak hour trips (965 in and 690 out).
- Access to Phase 1 of the site will be provided via two full movement driveways on NW Ingle Road. In the future when the site is built out, access will be provided on both NW Ingle Road and NW Goodwin Road.

Year 2018 Background Traffic Conditions

- Year 2018 background conditions (without construction of the Green Mountain mixed-use development) were estimated assuming completion of approved in-process developments within the study area and an annual 2% growth rate on City of Vancouver roadways.
- Operational analyses indicate that the study intersections are forecast to continue to operate acceptably.

Year 2018 Total Traffic Conditions

- Year 2018 total traffic conditions were estimated assuming completion of approved in-process developments within the study area plus Phase 1 of the proposed development.
- Operational analyses indicate that the study intersections are forecast to continue to operate acceptably under 2018 total traffic conditions with one exception:
 - The southbound movement at the intersection of NE Ingle Road/NE Goodwin Road is projected to operate at a LOS E during the weekday p.m. peak hour. This failure is triggered by the 203rd single family residential unit in Phase 1 of the development.

Year 2029 Background Traffic Conditions

- Year 2029 background conditions (with construction of only Phase 1 of proposed development but no further phases) were estimated assuming the same in-process developments included in the 2018 analysis as well as a one percent growth rate on City of Camas roadways and two percent growth rate on City of Vancouver roadways.
- Operational analyses indicate that the study intersections are forecast to continue to operate acceptably under year 2029 background traffic conditions with two exceptions:
 - The intersection of NE 192nd Avenue/NE 13th Street is projected to operate at a LOS E and over-capacity during the weekday a.m. peak hour and LOS F and over-capacity during the weekday p.m. peak hour,
 - The southbound approach to the intersection of NE Ingle Road/NE Goodwin Road is projected to operate at a LOS F during the weekday p.m. peak hour.

Year 2029 Total Traffic Conditions

- Year 2029 total traffic conditions were estimated assuming year 2029 background traffic and complete build-out of the proposed Green Mountain development.
- Operational analyses indicate that the study intersections are forecast to continue to operate acceptably under year 2029 total traffic conditions, with the exception of:
 - NE 199th Avenue/NE 58th Street (SR 500) (weekday a.m. and p.m.)
 - NE 192nd Avenue/NE 13th Street (weekday a.m. and p.m.)
 - NE Ingle Road/NE Goodwin Road (weekday a.m. and p.m.)

Turn-Lane Considerations

- An assessment of turn-lane need was conducted for each study intersection.
- The intersection of NE 199th Avenue/NE 58th Street (SR 500) meets WSDOT's guidelines for a right-turn lane on the eastbound approach under existing conditions and all future scenarios during both the weekday a.m. and p.m. peak hour.
 - The crash history indicates that no crashes were recorded between 2008-2013 involving vehicles making an eastbound right-turn.
 - Given the lack of crash history related to eastbound right-turns and the relatively small impact of Phase 1 (eight eastbound right-turn trips during the weekday a.m. peak hour, 27 eastbound right-turn trips during the weekday p.m. peak hour), no improvements are recommended in conjunction with Phase 1.
 - In the future, the provision of a right-turn taper or lane could be considered if suggested by the crash history at the intersection.
- The intersection of NE 242nd Avenue (SR 500)/NE 28th Street meets WSDOT's guidelines for a left-turn lane on the eastbound approach under existing conditions and all future scenarios during the weekday p.m. peak hour.
 - The crash history indicates that no crashes were recorded between 2008-2013 involving vehicles making an eastbound left-turn.
 - The City's long-term plans include a traffic signal and southbound left-turn lane at NE 242nd Avenue (SR 500)/NE 28th Street.
 - Given the lack of recorded crash history, the small impact of the proposed development (no Phase 1 eastbound left-turns and less than 10 at master plan build-out), and future improvement plans at this intersection, no turn-lane improvements are recommended with Phase 1 site development.

Recommendations

- Regardless of the proposed master plan application, we recommend that the City of Camas consider potential improvements to the intersection of NE Ingle Road/NE Goodwin Road to address intersection sight distance limitations associated with the location of the stop bar, such as relocating the stop bar.
- The following improvements should be provided in conjunction with site development:
 - Phase 1 Site Development

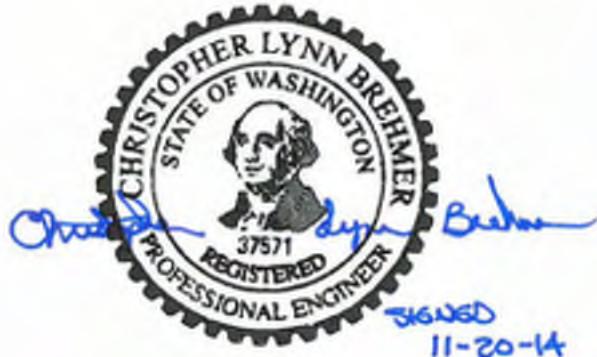
- An eastbound left-turn lane with 100 feet of storage should be provided at NE Ingle Road/NE Goodwin Road.
- A westbound right-turn lane on NE Goodwin Road at NE Ingle Road prior to occupancy of the 203rd single family home in Phase 1. The right-turn lane should provide at least 100 feet of storage.
- On-site and off-site landscaping and any above ground utilities at the site-access driveways and internal roadways should be provided appropriately to ensure that adequate sight-distance is maintained.
- For Phase 1 and all future phases, a Transportation Compliance Letter as described above should be prepared by a licensed professional engineer and submitted with the then-current site plan application.
- Full Build-Out of Site Development (items to be assessed in Transportation Compliance Letter unless otherwise mitigated):
 - Future site plan applications should provide an updated assessment as to the potential need for providing an eastbound right-turn taper or lane at the 199th Avenue (SR 500)/NE 58th Street intersection unless otherwise deemed mitigated by the project or others.
 - Pay a proportionate “fair-share” financial contribution towards capacity mitigations at the intersection of NE 192nd Avenue/NE 13th Street. This contribution would partially fund the eventual construction of a northbound right-turn lane on NE 192nd Avenue and a westbound right-turn lane on NE 13th Avenue.
- Mitigations will be needed to improve NE Ingle Road/NE Goodwin Road in 2029. We recommend the following:
 - The applicant construct a three-lane section (with center two-way left-turn lane) on NE Goodwin Road along the site frontage.
 - The applicant assess traffic volumes and signal warrants at NE Ingle Road/NE Goodwin Road with each phase of development and construct a traffic signal and related appurtenances when the intersection no longer satisfies City of Camas performance standard (LOS “D” and v/c of 0.90 or better) and intersection volumes meet traffic signal warrants.

- On-site and off-site landscaping and any above ground utilities at the site-access driveways and internal roadways should be provided appropriately to ensure that adequate sight-distance is maintained.

We trust this letter adequately addresses the traffic impacts associated with the proposed Green Mountain Master Plan development. Please contact us if you have any questions or comments regarding the contents of this report or the analysis performed.

REFERENCES

1. Transportation Research Board 2000. *Highway Capacity Manual*. 2000.
2. DKS Associates. *City of Camas Traffic Impact Fee Update*. May 2012.
3. Washington State Department of Transportation. *Design Manual*. July 2013.
4. C-Tran. <http://www.c-tran.com>. May 2014.
5. Oregon Department of Transportation Research Section. *SPR 667 Assessment of Statewide Intersection Safety Performance*. June 2011.
6. American Association of State Highway and Transportation Officials. *Highway Safety Manual*. 2010.
7. Institute of Transportation Engineers. *Trip Generation Manual, 9th Edition*. 2012.
8. City of Vancouver. *Traffic Study Guidelines*. December 2013.



Appendix B
Proportionate Share Cost Methodology

Proposed Proportionate Share Contribution at NE 192nd Avenue/NE 13th Avenue**Cost Estimate:**

Item	Unit Cost	Length	Cost	Notes
Northbound right-turn lane and westbound right-turn lane	\$ 280,000	1	\$ 280,000	Cost estimate attached.
		Total	\$ 280,000	

Note: Cost estimate may not account for all ROW impacts

Proportionate Share Calculation:

Intersection volume without development (2029 Background Scenario)	2208	<i>Note: without improvement, intersection operates within standards under 2018 background conditions</i> <i>Note: with proposed improvements, intersection operates within standards under 2029 total traffic conditions</i>
Intersection volume with development (2029 Total Traffic Scenario)	2524	
Trips added by development (2524-2208)	316	
Intersection Capacity without Improvement (2018 Background Scenario)	1808	
Additional volume accommodated with improvements (2524-1808)	716	
Proportionate share cost per trip (\$280,000/716)	\$ 391	
Proportionate share of capacity used by development (316/716)	0.441	
Proposed proportionate share contribution (\$391 per trip * 316 trips)	\$ 123,600	

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Green Mtn. - Right Turn Lane @ NE 192nd Avenue & NE 13th Street - Cost Estimate (Option I) North Bound Right & West Bound Right

Item #	Description	Unit Of Measure	Quantity	Unit Price	Total Price
GENERAL CONDITIONS					
1	Mobilization	LS	1	\$ 10,000.00	\$ 10,000.00
2	Clearing & Grubbing (Remove Hedge & Trees, etc.)	LS	1	\$ 2,400.00	\$ 2,400.00
3	Stripping 6" & Haul Off	CY	235	\$ 9.00	\$ 2,115.00
				Total	\$ 14,515.00
DEMOLITION					
4	AC Removal (Exist'g Edge Road & Exist'g Driveways To Ba	SF	2,070	\$ 1.00	\$ 2,070.00
5	Remove Exist'g Driveway Culvert (24 LF)	LS	1	\$ 300.00	\$ 300.00
6	Relocate Exist'g Mail Boxes	EA	5	\$ 125.00	\$ 625.00
7	Relocate Exist'g Signs	EA	3	\$ 125.00	\$ 375.00
				Total	\$ 3,370.00
EROSION CONTROL					
8	Silt Fence	LF	700	\$ 1.75	\$ 1,225.00
9	Hydroseed & Mulch Right - Of - Way	SF	14,000	\$ 0.30	\$ 4,200.00
10	Erosion Control Maintenance	LS	1	\$ 1,600.00	\$ 1,600.00
				Total	\$ 7,025.00
SITEWORK					
<u>North Bound Right & West Bound Right</u>					
11	Sawcut	LF	930	\$ 2.00	\$ 1,860.00
12	Mass Grading & Haul Off	CY	480	\$ 10.00	\$ 4,800.00
13	Finish Grade	SF	6,345	\$ 0.30	\$ 1,903.50
14	Geotextile Fabric	SY	765	\$ 0.90	\$ 688.50
15	1¼"- Crushed Rock (0.85')	TN	385	\$ 20.00	\$ 7,700.00
16	Asphaltic Concrete (0.85') Class ½" 64-22 HMA	TN	410	\$ 135.00	\$ 55,350.00
17	Curb & Gutter	LF	840	\$ 10.00	\$ 8,400.00
18	Sidewalk / Pedestrian Ramp	SF	4,275	\$ 4.00	\$ 17,100.00
19	Detectable Warning Surface	SF	10	\$ 25.00	\$ 250.00
20	Driveway Drop	EA	5	\$ 25.00	\$ 125.00
21	Driveway Approach (5)	SF	560	\$ 4.50	\$ 2,520.00
22	Pedestrian/Signal Modifications	LS	1	\$ 33,000.00	\$ 33,000.00
23	Traffic Control	LS	1	\$ 10,000.00	\$ 10,000.00
				Total	\$ 143,697.00
SITEWORK					
<u>Pave Existing Driveways To Right - Of -Way</u>					
24	Removal AC / Gravel (Back Of Sidewalk To Right - Of - Way)	SF	1,435	\$ 1.00	\$ 1,435.00
25	Finish Grade	SF	1,435	\$ 0.30	\$ 430.50
26	Geotextile Fabric	SY	175	\$ 0.90	\$ 157.50
27	1¼"- Crushed Rock (0.67')	TN	70	\$ 20.00	\$ 1,400.00
28	Asphaltic Concrete (0.25') Class ½" 64-22 HMA	TN	30	\$ 135.00	\$ 4,050.00
				Total	\$ 7,473.00

STORM						
29	Stormfilter Catch Basin (2 - Cart.)	EA	2	\$ 12,000.00	\$	24,000.00
30	Infiltration Trench (50 LF)	EA	2	\$ 2,500.00	\$	5,000.00
				Total	\$	29,000.00
STRIPING & SIGNAGE						
31	Solid Double Yellow Line	LF	470	\$ 1.00	\$	470.00
32	Solid White Line	LF	810	\$ 0.50	\$	405.00
33	White Thermoplastic Stop Bar (Extend Existing)	EA	1	\$ 660.00	\$	660.00
34	Crosswalk Marking (Extend Existing)	EA	1	\$ 750.00	\$	750.00
				Total	\$	2,285.00
Subtotal Construction Costs						\$ 207,365.00
Soft Cost (20%)						\$ 41,473.00
Contingency (15%)						\$ 31,104.75
Total Construction Costs						\$ 279,942.75